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# RESOLUTION

WHEREAS, the North Central Florida Regional Planning Council is preparing a Regional Comprehensive Plan, the basic goal of which is to "improve our quality of living;" and

WHEREAS, achievement of this goal is dependent upon sound comprehensive planning addressing the problems and opportunities for future growth and prosperity of the Region; and

WHEREAS, it is the policy of the Council to support the optimal use of the Region's natural resources, prevent their further degradation and rectify past damage; and

WHEREAS, it is an objective of the Council to plan for and promote the wise use of both renewable and non-renewable natural resources, and, further to promote responsible development within the tolerances of natural systems; and

WHEREAS, the adoption of the Natural Resources study will assist in the achievement of the goals, policies and objectives of the Council;

NOW, THEREFORE BE IT RESOLVED, the Council adopts the Natural Resources study to provide leadership and a workable strategy for the efficient management of the Region's natural resources.

_____

Jonathan F. Wershow, Chairman
February 23, 1978

_____

Jerry Scarborough, Secretary-Treasurer
February 23, 1978

Charles L. Kiester
Department of Geography

# NATURAL RESOURCES

The preparation of this report was financed in part through a comprehensive planning grant from the Department of Housing and Urban Development.

July, 1977

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This study identifies and describes the major natural resources of the North Central Florida Region, defining their areal extent as well as the relative values and limitations of their components. The report utilizes a series of maps depicting the physiographic characteristics of each resource. As well as a resource inventory, a method is presented to determine the relative feasibility of land development within the Region. Data and analytical techniques are shared with the Land Use Study. Goals, objectives and policies are recommended.

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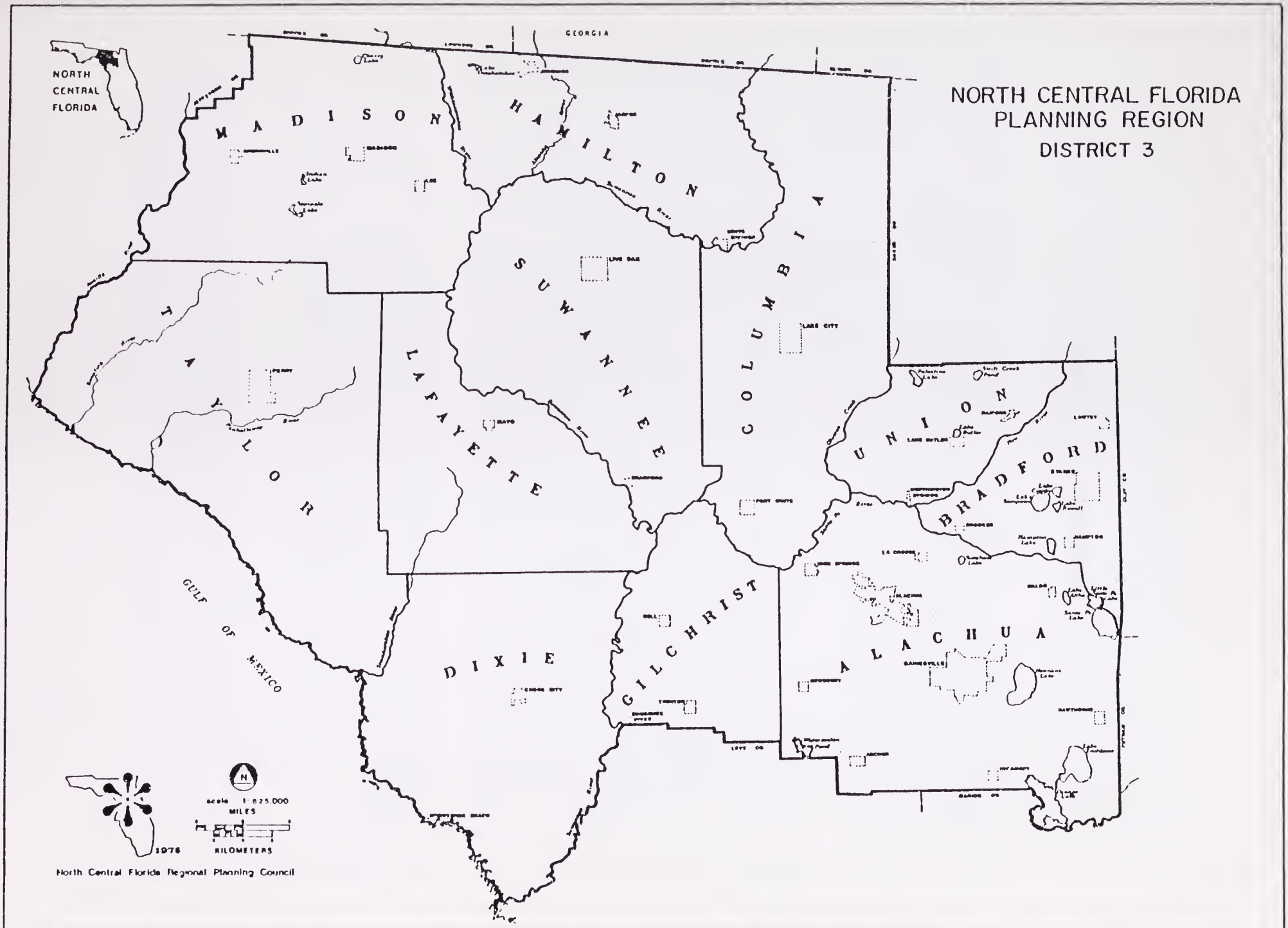
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LAFAYETTE
UNION
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DIXIE
GULF OF MEXICO
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KILOMETERS
1976
North Central Florida Regional Planning Council

# SUMMARY AND CONCLUSIONS

Based on the information presented in this report, it is apparent that all natural resource elements should be considered together because they constitute a system of interdependent processes. Each of these defined elements is affected by the others and in turn is affected by human activities. The cause and effect relationship of these systems is far more complex than any individual map suggests. Therefore, planners and governmental officials will undoubtedly need the continued assistance of specialists in a variety of fields to evaluate the advantages and disadvantages of specific plans and proposals.

However, the system of map comparisons utilized in this study appears to be one viable method of summarizing natural resources data despite the limitations imposed by utilizing subjective value judgements for map preparation. The continued collection of data and revision of these general maps constitutes a useful methodology for establishing general patterns of resource values and relationships. Through this method then, one tool is established by which the limits and distribution of future growth may be better evaluated and planned. This and similar documents such as the Land Use Plan may be utilized by decision-makers and planners to continually assess the trade-offs between growth and development versus quality of life in order to insure that future development is not only commensurate with environmental needs but also in the best long term interest of the citizens of the Region. A number of general conclusions may be reached which generally reflect a need for degree of sophistication in natural resource considerations for local and regional planning efforts.

Areas of relatively high sensitivity to development are vulnerable to abusive uses of surrounding land as well as direct developmental impact. As evidenced in part by isolated sensitive "islands" of valuable wildlife habitat, long term impacts affected by seemingly very low density developments may have, through time, substantial long term environmental repercussions. Therefore, potential indirect environmental impacts must be adequately addressed during development review and future land use planning activities.

The high natural values of wetlands as described in this report are not usually respected during development considerations, nor is their potential fully utilized in development practices. The need for further development policies by all local governments is therefore suggested not only for wetlands but also for other poorly drained areas within the

Region. Similarly, developments in and around areas of environmental concern, such as San Felasco Hammock, Paynes Prairie of Hixtown Swamp, need to be thoroughly evaluated in order to insure that long term environmental deterioration does not occur. A consideration of the possible useful employment of wetlands and other valuable natural areas for human purposes would be a useful consideration in long range land use planning for individual counties in the Region.

Land use implications of natural resources as suggested by this study are so varied and complex that this study cannot be considered the final end product of a natural resources survey. It constitutes a portion of the total work effort toward realizing and planning for the full and beneficial use of these resources.

Undoubtedly new information on natural resources in the future will provide data which will alter, at least to some degree, the implications of the maps presented herein. Such revision is in the best interest of the Region and should be encouraged as new information is available. In essence, however, it is important to acknowledge that the inter-relationships as expressed or implied in the text do exist, and because of their far reaching consequences, they must play a key role in development decisions is natural systems are to continue to effectively function in our environment.

Therefore, the individual elements of this environmental inventory continually need to be combined, not only with one another, but also with information on land use, economics, transportation, population, housing and many other items for use in preparing comprehensive land use plans and for formulating decisions concerning specific projects and programs.

# INTRODUCTION

## PURPOSE AND SCOPE

The way in which our natural systems, and in particular our land resources are planned, or in many instances not planned, has a great influence on the quality of our environment. It is becoming apparent that land use decisions have a direct relationship to environmental quality.

In our efforts to promote growth and enhance the economic utilization of natural resources it is often easy to overlook that many activities are still closely tied to the natural resources and systems of the earth. It is, therefore, important to recognize that the materials and energy resources required to support our growth originate from and are returned to these ecological sector. Following mans utilization by-products of these resources returned to the environment as waste are reassimulated by natural systems. Environmental impacts result when imbalances occur and natural systems are unable to cope with resource by-products.

Continued anticipated increases in the size of human populations will in part serve to compound ecological problems due to mans dependence on the products of the environment. In the long term, in order to avoid the potential loss in individual freedoms due to environmental limitations, the distribution of production and consumption activities must be compatible with the ecological characteristics of the environment. To place these considerations into perspective, it is important to recognize that, as residents of north central Florida, we depend on natural resources for many services such as water supply, flood control, purification of waste materials, recreation, visual aesthetics, fishing and game propagation. Moreover, if agricultural resources are included, then we depend upon this resource for our food supply. In the past, the spread of urban communities has often resulted in the alteration of natural systems in preference to artificial systems which are more expensive in terms of time, money, energy and materials. The one small but common example is the destruction of numerous shade trees in development areas prior to the construction of generally inefficient, high energy consuming single family dwellings. Since 1973, continual reports on the status of our declining energy reserves has reinforced the need for energy conservation efforts. When placed in an economic perspective, the stimulus for motivation has provided a powerful, hopefully adequate incentive to plan for changes.

Many times in the past, planning projects have been based on economic, political, engineering and other concepts that have considered natural or environmental processes as only incidental to primary project goals , This has come about not so much because decision makers pay no heed to environmental issues, but because environmental concepts are often complex, difficult to comprehend in their entirety and potential long term problems and system interrelations are hard to quantify and define.

It is apparent that provisions for human well being and the maintenance of a high standard of living depend in large part on the effective utilization of our natural resources. For north central Florida, the evaluation of natural resources is an essential element in the overall planning process. Their inclusion becomes particularly important when they are viewed in terms of their intimate role in the development of effective long range plans for managing land and water resources.

This study, therefore, presents an effort to compile basic data on natural systems in the region for input into the comprehensive land use planning process. The suitability maps prepared for this study are not land use maps. They do, however, depict the distribution of natural systems throughout the region. Their inclusion into the comprehensive planning process, which serves to optimise the compatibility of different land uses, is essential in order to ensure stable long term productivity of the land. Recognizing that the real world possesses a very complex natural system, this report becomes a first step for north central Florida in the search for an effective means of rational development of the physical environment.

## METHODOLOGY

Because the interactions between man and his environment are numerous, subtle and complex, there are no simple solutions to problems involving natural resources. Due to the difficulty in envisioning these interrelations, it is necessary to employ a systems, or a whole-picture, approach for comparing, visualizing and evaluating the complex associations between the principal natural resources of the region. Therefore, an overlay technique, similar to that promulgated by McHarg (1969), has been utilized in this report to compare and describe the regions, geology, water resources, soils, vegetation, wildlife and other characteristic resources in terms of their capabilities or limitations.

On the basis of data summarized and presented in discussions for each natural resource individual interpretative maps have been prepared. Each map illustrates the basic components of each resource and by a system of pattern intensity presents a general ranking of resource components as they relate to the potentials or limitations imposed with respect to increasing intensity of land uses offered by each particular component.

For purposes of resource comparison, each map has been limited to six categories of pattern intensity in which the lightest (or white) sections represent areas having the least environmental sensitivity (or are most suited for development) and the dense (darker) patterns represent areas that are more environmentally sensitive or have the highest relative natural value. These patterns represent only the relative sensitivity or suitability of each resource as it relates to the components represented on each individual map. Because of the large number of possible interactions between elements of each map, no attempt was made to assign quantitative values to each category or to adjust pattern intensity on any map to reflect the relative importance of one resource with resources represented on other maps. Therefore, each map is intended to illustrate the relative value of each resource element only in respect to the particular resource map.

In order to facilitate an analysis of the recognized resource values a clear acetate copy of each map was prepared. A visual comparison between all or selected resources and land use systems can therefore be made by superimposing any or all of the individual maps over a light source. For purposes of reproduction, it is not possible to include acetate overlays with each published document. The original maps, however, will be available for inspection at the Council offices.

Despite the limitations imposed by qualitative rather than quantitative data, the system of map overlays employed allows the comparison of a variety of resources and visually defines areas having significant limitations or suitability for growth. This comparison allows qualitative decisions to be made on general trends and intensities of land use for the region in order that the resources of the land may be used for the highest and best interests of its inhabitants.

# PHYSIOGRAPHY

## INTRODUCTION

A consideration of earth features or physical geography is an important element in land use planning. Topographic characteristics of the region, reflecting variations in elevation, land forms and degree of slope, affect the region's ecology and suitability for human use. More specifically, land forms often greatly influence the type and cost of development, control the rate and direction of water runoff, contribute to landscape aesthetics, influence weather and climate and affect the type and amount of vegetation and wildlife in the region.

Topographic information can be obtained from several sources and is most commonly found in the form of maps or aerial photographs. The United State Geological Survey (USGS), a division of the Department of the Interior, produces standard topographic maps covering the entire United States. Each map is bounded by parallels of latitude and meridians of longitude. These "quadrangle" maps are produced in three series: a 7-1/2 minute series covering 7-1/2 minutes of latitude and longitude at a scale of 1:24,000; a 15 minute series covering 15 minutes of latitude and longitude at a scale of 1:62,500; and a 30 minute series covering 30 minutes of latitude and longitude at a scale of 1:125,000. The two 30 minute maps which cover the region, Gainesville, Florida and Valdosta, Georgia, are particularly useful for defining the major land forms of north central Florida.

The topography of the region owes its character to three primary factors. The first involves alternating advances and recessions of the sea during each of the major Pleistocene (10,000 to 2,000,000 years ago) ice ages. Terraces or wave-cut beaches eroded into local land surfaces wherever each advance remained stationary before ultimately retreating. As many as five terraces represented as hills or rises in local land surface ranging to over 200 feet in elevation have been identified in Florida, several of which including the Pamlico, Silver Bluff, Okefenokee, and the Wicomico terraces have been identified in the region.

The second factor is the solution by ground and surface waters of the relatively soft limestone formations underlying much of the area. The term karst topography is used where such solution has served to divert

waters to underground routes or create lakes by forming depressions in the limestone down to the ground water level. Such differential solution has been a significant factor in creating lakes, eliminating surface drainage by streams, and forming sinkholes in some areas.

A third factor influencing the shape of topography is erosion including both stream erosion and sheet wash. The abundant rainfall recorded at all stations within the region periodically enhances the potential for erosion, particularly in sloping or transitional areas.

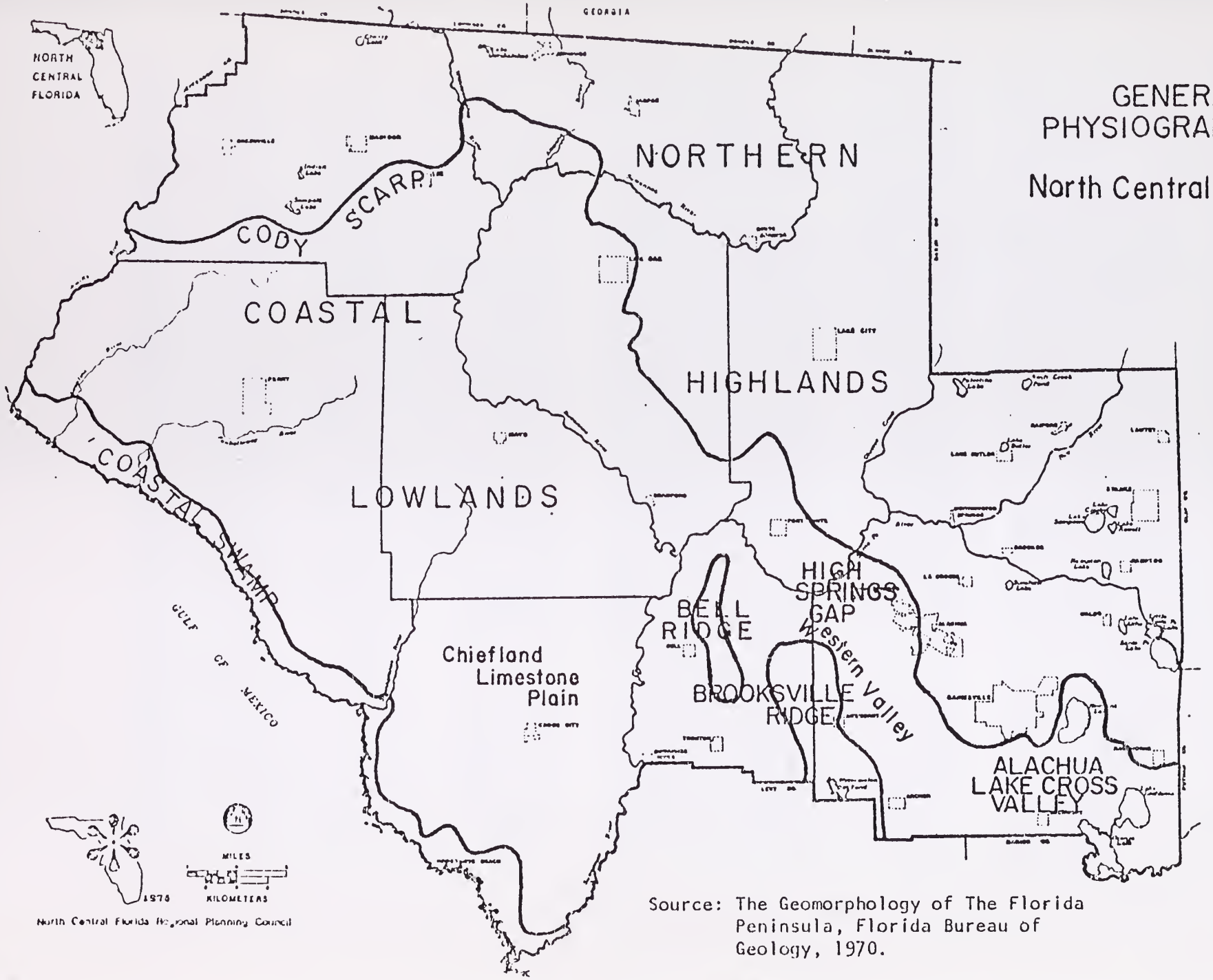
In general, the north central Florida region is divided between two major physiographic provinces, the Northern Highlands and the Coastal Lowlands. The former includes the majority of Bradford, Union, Columbia, and Hamilton Counties in addition to portions of Alachua, Suwannee, and Taylor Counties. In general, the terrain in the southern portion of this province is maturely dissected into gently rolling hills. The highest elevations are found northward into the flatter undissected parts of the province where streams generally have made little incision into the relatively flat and often swampy interior.

The Coastal Lowlands include most or all of Dixie, Taylor, Lafayette, and Gilchrist Counties as well as the more southwestern portions of Alachua, Suwannee, Madison, and Hamilton Counties. The Coastal Lowlands are typified by generally flat topography, sloping gradually southwestward to the Gulf of Mexico. The entire lowlands area is characterized by large, poorly drained swamps, marshes and forested lands with a number of lakes and streams. The coast along the Gulf in Dixie and Taylor Counties is typified by vast expanses of coastal marshes with relatively few areas of natural beach. The General Physiographic Map which follows illustrates the major features of the region.

## REGIONAL OVERVIEW

The Central Highlands extends completely across the northern part of the State and into Georgia and Alabama. It is limited to the south and east by an erosional scarp which represents the most persistent topographic break in the State. The continuity of this scarp, known as the Cody Scarp, is unbroken except by major stream valleys. It is thought to represent the retreating edge of a formerly more extensive high plain which sloped northward toward the Okefenokee Swamp.

The Northern Highlands is a remnant of a once continuous highland that has been broken down by erosion and solution. East of the Suwannee River and near the scarp the land is maturely dissected into a rolling terrain. Toward the north, the terrain flattens considerably where the Highlands remain relatively undissected by streams. The highlands are represented in the subsurface by Miocene sands and clays and with




# GENERAL PHYSIOGRAPHIC MAP

## North Central Florida

Source: The Geomorphology of The Florida Peninsula, Florida Bureau of Geology, 1970.

limestones evident at the surface in the lowlands. Principal geomorphic features of the Northern Highlands include the Western Valley, High Springs Gap and Brooksville Ridge.

The Brooksville Ridge is a linear feature approximately 110 miles in length. Elevations on its irregular surface vary from about 70 to 200 feet. It is composed of a thick sequence of sands believed to have been deposited as a result of the Wicomico stand of the sea at about 100 feet in elevation. The relative insolubility of its component sediments has allowed the Brooksville Ridge to persist as a highland while surrounding lands have been lowered by solution of underlying limestones. The Ridge itself has few continuous valleys and exhibits little surface drainage.

The geomorphic feature known as the High Springs Gap lies directly north of the Brooksville Ridge. It merges with the Western Valley to the south where limestones are noted as lying at or near the earth's surface. The Santa Fe River flows through this erosional gap toward the Suwannee River.

It is of note that there is a tendency for streams to go underground in the lower part of the scarp zone west of Gainesville. Except for the Suwannee every stream which enters the scarp zone passes underground re-emerging again after crossing the scarp. East of Gainesville, all streams retain a surface flow prior to crossing the scarp. The difference in flow characteristics is attributable to exposures of the clayey Hawthorn Formation in the eastern portion of the area, and of soluble limestones to the west. The absence of the Hawthorn Formation causes the piezometric surface to be lower than land surface allowing streams such as the Santa Fe River to pass underground through solution channels.

The southwestern portion of the region is part of the physiographic province known as the Gulf Coastal Lowlands. Beginning at the present coast of Dixie and Taylor Counties, this province extends inland to the Cody Scarp bordering in Northern Highlands. Including the Wicomico, three marine terraces, including the Silver Bluff and the Pamlico, represent ancient shorelines in this province.

The Silver Bluff terrace is the youngest represented in the region. In Dixie County it extends inland as far as six miles and is in part represented by the coastal marshes. The Silver Bluff terrace is noted as being considerably more narrow in Taylor County.

Although the Pamlico Sea did not extend inland to any great extent, it produced a series of sand dunes parallel to the coast in Taylor County. It is generally defined by a marine terrace lying between the 10 and 25 foot contours in both Dixie and Taylor Counties.

In western Gilchrist and eastern Dixie Counties, the relatively flat swampy land surface is underlain by shallow limestones which represent

a continuation of the limestone shelf extending northward from Levy County, known as the Chiefland Limestone Plain. A series of sand hills to the east of this plain, known as Bell Ridge, is mostly likely associated with a relict barrier chain. The elevations of these hills vary between 80 and 100 feet above sea level.

An area known as the Wacassassa Flats lies between Bell Ridge and the Brooksville Ridge. The origin of this swampy area is not certain. Its lithology varies from a sand to clayey sand and its sediments may be found to be between 14 to 18 feet thick over a limestone surface.

The Western Valley of western Alachua and eastern Gilchrist Counties serves to connect the High Springs Gap and Alachua Lake Cross Valley, the latter named for the former Alachua Lake, now Paynes Prairie, which occupies the basin. Each of these areas is characterized by shallow limestones and the general absence of surface drainage systems. This valley in Alachua and Gilchrist Counties has been called the Williston Limestone Plain and is notable because of the absence of impermeable sediments which permit the rapid movement of rainfall into the underlying limestones of the Floridan aquifer.

A notable feature of the Coastal Lowlands is the extensive system of coastal swamps. The irregular coastline of Dixie and Taylor Counties is characterized by rock outcroppings, oyster reefs and island clusters. Beaches and semi-enclosed bays are rare and salt marshes line extensive areas of its shoreline and penetrate inland up to several miles in some places often merging with freshwater swamps. Although sand beaches are common to Florida's coast, the general absence of beaches in this region is attributed to its low energy shoreline which does not enhance beach development.

## INFLUENCE OF TOPOGRAPHY

Urban development tends to follow the direction of least topographic resistence dependent only on limitations imposed by modern technology. It may often be observed that rivers and valleys tend to channel urban expansion; major highways and railroads tend to follow river channel routes because of the generally gradual continuous grades; and bridges that often open up new areas for development tend to be constructed at the narrowest points of rivers of where the river is shallow, exhibits a hard bottom and easy access grades. Therefore, topography to a large extent helps shape patterns of growth.

Topography, or landform, interacts with those physical characteristics that help shape or form it, such as type of soils, drainage patterns, climate and vegetation. Therefore, because of its imposition on the natural environment, land development, whether for relatively low

intensity agricultural uses or high intensity residential use, must insure the stability of topography during physical development by providing adequate grading (slope stabilization), drainage and soil structures in order to make the best use of the site within the limitations set by the topography.

There are almost no areas in the region that possess topographic limitations so great as to preclude specific types of development. Modern engineering practices can override almost all limitations if economics are not a problem. However, there are areas which do limit themselves to particular uses because of topography. Examples of such areas would include swamps and other poorly drained areas, steeply sloping stream banks and flood plains.

One concept specifically concerned with the limitations to development as imposed by topography is referred to as slope use zoning. This concept revolves around the maxim which maintains that within the framework of construction practices and technology, there are certain slopes, or ranges of slopes, upon which certain types of construction can be most economically undertaken.

It has been observed that on certain specific slopes the cost of construction to meet the common needs of certain land uses will be minimized. This cost of construction, as reflected in the consumer cost, includes not only the cost of the structure, but also the costs of site preparation, site development, utility services and the provision of necessary drainage facilities and access roads. Some of the basic provisions of the slope use zoning concept are outlined in Table 1.

The effects of erosion increase directly with degree and length of slope; therefore, it is sometimes desirable to establish constraints to development based upon slope. As exhibited on Table 1 low slopes are usually highly desirable for residential development because they are typically well drained, easier to build upon that steeper slopes, and do not impose limitations to vehicle access. However, even on low to moderate slopes, precautions may need to be taken to retard or prevent serious erosion, especially during construction stages of development.

Contigent upon soil and bedrock conditions, slopes over 10% generally impose greater construction problems and costs in order to insure slope integrity and the stability of structures on such slopes. While steep slopes do provide opportunities for creative architecture and site planning and may be desirable from an aesthetic point of view, increasing density of units often creates other potentially hazardous conditions which must be anticipated early in the planning process.

In general, very steep slopes are unsuitable for any form of urban, agricultural or forestry use because removal of trees and other vegetation produces rapid erosion, resulting in sedimentation in streams and heightening of flood peaks. Such slopes are most appropriately reserved for limited recreational uses.

TABLE 1
GENERAL SLOPE USE ZONING

| Slope | Limitations |
|---|---|
| 0-1% | Drainage problems make many types of development unsuitable. Limited farming and large scale lineal production industry are often economically feasible. |
| 1-5% | Commercial and residential developments of all types are feasible because of generally good natural drainage and easy slopes. Good general farming potential. Roads begin to follow topographic contours. |
| 5-12% | Small scale commercial structures and intensive small industry feasible. Terrace type landscaping favors clustered single family residences on large lots and roads are generally parallel to contours. General farming from 5-8%, specialized farming to 12% |
| over 12% | Industry and commerce usually economically impractical. Isolated single family residences on large lots are feasible. All types of roads become expensive and only specialized farming is practical. |

In north central Florida, slopes are not generally found in extremes. The greatest topographic problem areas in the region are those having very low or flat slopes exhibiting poor drainage and which often appear as wetlands or flood hazard areas on topographic maps. Only small areas appear to have excessively steep slopes, and those primarily occur along stream margins. Moderate to steep slopes are generally found in those areas of the region where the topographically higher sand terrace deposits grade westward and down to the Hawthorn Formation and subsequently to the limestone plain of the Coastal Lowlands.

In all but a few areas, steepness of slope does not impair development potential. Due to modern engineering technology and the desire for an aesthetically pleasing environment, limited development often occurs in areas of moderate to steep slopes. As long as proper development limitations and controls are observed during development and in early planning stages, limited areas of moderate to steep slopes in the region pose serious threats only when located or developed in such a manner as to create undue adverse environmental impact. Such impact could result in part from the destruction of natural vegetation causing

increased erosion and sedimentation; the destruction of valuable areas of unique river forest vegetation; inadequate provisions for surface runoff in terms of both quality and quantity into natural water courses; and site deterioration caused by a poor accounting of soil, watertable and bedrock properties during the planning process.

Areas of very flat slopes cover significantly large areas in the region and usually exhibit other properties which identify them as having poor or limited development potential. These might include poor soil suitability for development, flood plain designation, low relief with typical low-land topographic characteristics such as a high water table and lowland vegetative species. Therefore, physiographic limitations must also be assessed in terms of associated natural systems or conditions caused by the interaction between environmental factors.

For the purpose of this study, it was not necessary to prepare a map illustrating the region's topography principally due to limitations imposed by map scale. Areas in the region having steep slopes are of such limited areal extent as to make them almost indistinguishable on the map scale utilized in this report. Large areas of relatively low slopes on the other hand, are readily identified on available topographic maps and in most cases, because of other characteristic features such as their vegetative or wetland nature, otherwise reflect topographic influence.

# CLIMATE

## INTRODUCTION

An overview of climate is an essential element in a consideration of north central Florida's natural resources. The subtropical nature of our environment is one of the region's most notable resources. Its value lies not only in the human perception of climate but, perhaps more importantly, for the net input of energy to natural systems due to latitude and solar insolation. As an integral resource of the region, it helps shape or modify virtually every other natural resource and influence human activities.

## GENERAL REGIONAL CLIMATE

Climatic conditions in the region represent a zone of transition between temperate and humid subtropical climates generally typical of the continental east coast below 35° of latitude. It is characterized by long, warm and relatively humid summers and mild winters with periodic invasions of colder northern air masses. The three principal interacting factors which influence climate in north-central Florida include:

1) Latitude;
2) Proximity to the Gulf of Mexico and;
3) Numerous inland lakes and wetland areas.

Latitude in large part determines the intensity and duration of insolation (solar radiation) reaching the earth's surface. During summer months, when greatest, insolation heating the earth creates strong convective currents which often produce summer thunderstorms. The influence and interaction of tropical maritime air masses and continental or polar air masses during the year, modified by local topography, greatly contribute to climatic conditions.

Summer heat is often tempered by sea breezes in coastal areas and by frequent afternoon and evening thundershowers in all areas. Thunderstorms occur on the average about one-half of all summer days. They often result in a 10-20°F drop in temperature.

Gentle breezes of about 5-10 miles per hour occur over most of the region throughout the year. Wind directions are locally influenced by convectional forces inland and the "land and sea breeze" effect near the coast. Prevailing wind directions in the region are sometimes erratic but, in general, are northerly during winter months and southerly in the summer. Such breezes serve to mitigate otherwise oppressive conditions of temperature and humidity.

Little convectional rainfall occurs during winter months due to a reduction in insolation, producing cooler earth surfaces, and frontal winds associated with high pressure areas developing over the continent. Cold waves, generated from high pressure frontal systems seldom last over 2-3 days or result in temperatures much below 15-20°F. The greatest recorded snowfall in Florida was recorded on February 13, 1899, when four inches were recorded at Lake Butler.

Climatic extremes represented by hurricanes, tornadoes and hailstorms do not constitute significant events in the region's climate. Hailstorms occasionally occur during spring and summer months associated with thunderstorms. Tornadoes and snowstorms are also infrequent with a probability of less than 3% for both. Hurricanes also constitute major climatic events with winds commonly exceeding 70 miles per hour and rainfalls over 7 inches. In north central Florida, there is approximately a 5% chance of a hurricane passing through the area. It is of note that a hurricane of 100-year storm intensity can be expected to create tides up to 12-14 feet in the coastal areas of Dixie and Taylor Counties.

Specific climatic conditions occuring within the region are addressed in suceeding paragraphs.

## Temperature

The warmest months of the year in north central Florida are May through September, when temperatures average between 75° and 80°F. The coldest winter months are November through February with temperatures averaging 55° to 60°F. Table 2 presents the average monthly temperatures for Madison, Lake City and Gainesville, The slighly cooler temperatures for stations north of Gainesville are evident for most months of the year.

Many given summer temperatures vary little from day to day while considerable day to day variations are evident during winter months. Temperatures exceeding 100°F are relatively infrequent in north central Florida. Conversely, freezing temperatures at or below 32°F can be expected to occur from 48 to 56 days each year, depending on location in the region. Table 4 illustrates the average dates between which freezing temperatures might be expected to occur during any given year.

TABLE 2
AVERAGE TEMPERATURE

| STATION | PERIOD | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. | Yearly Aver. |
| Madison | 53.9 | 56.0 | 61.6 | - | 75.8 | 80.3 | 81.3 | 81.3 | 77.9 | 69.7 | 60.2 | 54.5 | - |
| Lake City | 54.9 | 56.7 | 62.0 | 68.9 | 75.0 | 79.5 | 80.8 | 80.9 | 78.0 | 70.2 | 61.4 | 55.8 | 68.7 |
| Gaines-ville | 57.0 | 58.6 | 63.6 | 70.0 | 75.8 | 81.1 | 81.2 | 79.1 | 71.8 | 71.8 | 63.3 | 57.8 | 69.9 |

TABLE 3
AVERAGE RAINFALL

| STATION | PERIOD | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. | Yearly Aver. |
| Madison | 3.43 | 3.94 | 5.36 | 3.88 | 3.34 | 5.61 | 7.19 | 6.03 | 5.48 | 2.61 | 2.39 | 3.37 | 52.6 |
| Lake City | 3.43 | 3.87 | 4.06 | 3.27 | 3.84 | 8.48 | 7.37 | 6.85 | 5.88 | 3.52 | 2.29 | 3.26 | 54.1 |
| Gaines-ville | 2.84 | 3.70 | 4.26 | 3.02 | 3.54 | 6.81 | 8.03 | 8.25 | 5.67 | 3.67 | 1.92 | 2.88 | 54.6 |

TABLE 4
FREEZE DATA*

| STATION | AV. DATE LAST SPRING OCCURRENCE | AV. DATE FIRST FALL OCCURRENCE | AV. DAYS BETWEEN DATES |
|---|---|---|---|
| Madison | Feb. 19 | Dec. 2 | 286 |
| Lake City | Feb. 22 | Dec. 1 | 282 |
| Gainesville | Feb. 14 | Dec. 6 | 295 |

*Temperatures at or below 32°F.

Source: Climatic data drawn from Climate of the States, Volume 1, NOAA, 1974, and Climatological Data Annual Summary for Florida, 1976, prepared by the National Oceanic and Atmospheric Administration (NOAA).

## Precipitation

Rainfall in north central Florida varies greatly from year to year and its distribution is quite uneven throughout each year. The average annual rainfall in the region is about 52 to 54 inches, yet one year in ten may have more than 85 inches or less than 23 inches. Even though yearly rainfalls are relatively large, the region is not immune to droughts. Periods of prolonged rainfall deficiency are occasionally experienced in the region and Florida as a whole which can have substantial adverse impacts to water supplies and the agriculture industry.

The seasonal distribution of rainfall is similar throughout the region. There is a distinct summer rainy season from June through August as illustrated in Table 3 of average monthly rainfalls. However, the beginning and end of the rainy season may vary considerably. A secondary seasonal peak in rainfall occurs in the late winter months of February and March. The fall months of October and November are notably lower in rainfall and are typically the driest months of the year. Monthly average precipitation values may vary considerably from year to year with values differing considerably from given monthly rainfalls.

The greatest part of summer rainfall originates from local thunderstorms. These are primarily local by nature therefore, large differences in monthly and annual rainfalls between localities are common. Summer rains lasting one or more days are usually associated with tropical disturbances and are generally infrequent.

## Other Climatic Factors

Variations in relative humidity are generally small with inland areas with greater temperature extremes generally having lower values. On the average, values of humidity range from 50 to 65 percent during afternoon hours to about 85 to 95 percent during night and early morning hours.

Heavy fogs may be expected to occur during night and early morning hours of the late fall, winter and early spring months. They may be expected to occur on the average about 25 to 30 days in any year. Dissipation usually occurs shortly after sunrise.

Although southern Florida experiences a higher percentage of possible sunshine hours than the northern portion of the state, records indicate that the sun shines about two-thirds of the possible sunshine hours in the state. On the average, the maximum possible hours of sunshine in the region varies between 14 hours during June to 10 hours during

winter months having the shortest days. Generally clear skies, averaging 4-7 percent cloud cover on any day, contributes to the amount of sunshine impacting on the earth.

Air pollution in the form of vehicular emissions, products of land clearing operations, noise and wastes from industrial centers are also important climatic components. Fortunately, however, air pollutants in significant concentrations constitute primarily local impacts within the region.

Air movements over the region are usually sufficiently unstable to discourage the potential for episodes of air pollution. The general pattern of Trade Wind circulation and summer patterns of high convection associated with the formation of thunderstorms generally insure the dispersal of air pollutants in the region. This is borne out by a forecast by the Department of Environmental Regulation indicating an average of only ten high air pollution potential days for the region in any given year.

## INFLUENCE OF CLIMATE

The influence of climate on urban structure has been all but neglected in the planning and design of our modern human environment. The resulting waste in money, natural resources and fossil fuels may never be fully realized. The "energy crisis" warnings that have deluged the nation since 1970, predicting impending world shortages and the need for conservation, have served to highlight deficiencies in urban design.

In general, there are eight determinants of climate quality that influence urban structure and development: 1) latitude, 2) altitude, 2) landform, 4) water bodies, 5) temperature 6) wind, 7) humidity, and 8) precipitation. In order to successfully cope with climatic conditions in Florida, early settlers designed structures to take advantage of these determinants to the extent materials and technology permitted. In recent years, rapid developments in methods of climate control within structures, coupled with an apparently limitless supply of cheap energy, led to the development of inefficient structures and accompanying urban forms highly dependent on outside sources of energy for utilization. It is rapidly becoming apparent that the shape of future structures will rely heavily on innovative energy efficient technology if a high quality of life is to be available for our citizens.

Although the portion of the nation's energy consumption used in the residential sector is only 19 percent, as compared to 42 percent for industry and 25 percent in transportation, it is of major significance.

While energy users in industry and transportation consume sizeable amounts of energy over relatively short time periods, the siting and construction of housing establishes an energy demand which can be expected to last through several decades of anticipated use. Clearly climatic adaptations in structure and urban design must be undertaken in the interest of both the individual as well as the general public. The potential economic and resource savings will greatly influence our future "quality of life."

# GEOLOGY

## GEOLOGIC OVERVIEW

The Florida Plateau, which separates the Gulf of Mexico from the Atlantic Ocean, consists of thick layers of limestone and unconsolidated sediment which have accumulated over a basement (the Continental Shelf) of sandstone and igneous rock. By the intermittent submergence of this plateau in shallow seas over the past 150 million years, and subsequent deposition of carbonate (limestone) and clastic materials, the Florida peninsula slowly formed and now represents the above water portion of the Florida Plateau.

While the Plateau itself is comprised of rock formations thousands of feet in thickness, only those few rock formations lying at or near the earth's surface are relied upon for resources important for mans survival, growth and development. There are many facets which must be examined in a consideration of these resources. The relatively thin layers of soil and low relief of Florida's topography might suggest that geologic considerations are not important, yet they greatly influence the type, degree and quality of many surface activities. The chemical composition and physical characteristics of those rock strata accessible from the surface often make them amendable to the hydraulic transfer and storage of water in aquifers. These near-surface materials also yield useful rock and mineral products such as gypsum, clay, phosphates, limestones, and marls, all of which are useful raw materials for a wide variety of human applications. Many such geological products are found beneath north central Florida, some of which have been mined in the past and others which may be commercially valuable in the future.

## GENERAL GEOLOGY

The topography and structure of those formations at or near the earth's surface show evidence of past geologic activity. Natural uplifts in the earth's crust resulted in the formation of structural features such as the Peninsular Arch and the Ocala Uplift. Both are evident in north central Florida and have created slight regional slopes toward the Gulf

of Mexico. Subsequent erosion helped form much of the topography of north central Florida. With respect to more recent geologic activity one source reports that there have been numerous episodes of natural seismic activity on the Florida platform only two of which have been significant. Two earthquakes are cited, in 1879 and 1900, which were of sufficient magnitude to have been recorded in the area of St. John's River Fault Zone. Other fault zones related to Tampa Bay and Charlotte Harbour have apparently not been active since Paleocene time (40 million years ago). Therefore, in terms of seismic or geologic activity, the Florida Plateau appears to be regarded as a highly stable area with very minor earthquake potential.

In general, the rock formations lying within several hundred feet of the earth's surface in north central Florida may be described collectively as consolidated and semi-consolidated marine and non-marine deposits of sand, clay, marl, limestone, and dolomite (a magnesium rich limestone). The individual rock formations discussed in succeeding paragraphs will further describe these relatively "shallow" deposits. Those lying deepest below the region are discussed first or in this case, oldest to youngest. It is noted that all formations described are not continuous in the subsurface beneath the region. The aerial extent of those formations exposed at or lying immediately beneath the surficial soils layer are depicted on the general geology map.

In general, the surface deposits of north central Florida are mostly limestone which resulted from marine deposition from the Eocene Epoch (deposited from 58 to 36 million years ago), and the Oligocene Epoch (deposited from 36 to 25 million years ago). These limestone are generally very high in calcium carbonate content, and occasionally have been silicified to material commonly known as chert. In the eastern portion of north central Florida, these limestones are covered by Miocene to recent sands and clays (deposited from 25 million years ago to the present) of variable thickness, with the thickest sequences being found in highland areas.

The Lake City Limestone, lying beneath the region at considerable depth, is the oldest formation from which supplies of fresh water are obtained. Nowhere is this formation exposed at the surface in Florida. It is principally a dolomitic limestone which includes many beds of sulphur, fossiliferous limestone and seams of peat or lignite. The Lake City Limestone approaches the surface in southeastern Alachua County where it has been found lying approximately 150 feet below mean sea level. It is overlain in the subsurface by the Avon Park Limestone which is a dense porous dolomite with few beds of limestone. The Avon Park is the oldest formation exposed at the surface in the state. Overlying these foundations are the limestone formations known collectively as the Ocala Group. These limestones are usually considered as a unit because of their similarity. They include the Inglis, Williston, and Crystal River Formations. These formations lie strategraphically above the Avon Park Formation, and are noteworthy because they comprise the bulk of the tremendous groundwater reservoir known as the Floridan Aquifer.

Of those formations which comprise the Ocala Group, the Inglis Formation is the oldest, and does not outcrop at the surface. The overlying Williston Formation, as the oldest exposed formation in the region, occurs at the surface only in the southwestern portion of Dixie County. Both formations can be generally described as shallow, marine, fragmental fossiliferous limestones. Both are noted as an important source of roadstone in Florida. The Crystal River Formation lies above the Williston and is exposed at or near the surface of the earth and has been found near the surface in Alachua, Dixie, Gilchrist, Lafayette and Madison Counties. This formation was formed as a shallow marine limestone and contains many large foraminifer and mollusks. The Crystal River Formation is noted as an important source of high calcium limestone and has been recognized as a chief supply or roadstone in Florida.

The Suwannee Limestone has been found to overlie the Ocala Group in portions of Taylor, Suwannee and Madison Counties. Due to their similarity, there is often difficulty distinguishing between the limestones of the Ocala Group and the Suwannee Limestone except by characteristic fossil elements. The Ocala Group, Avon Park and Lake City Formations, and the Suwannee Limestone and sometimes the overlying limestone beds of the Hawthorn Formation are considered together as the Floridan Aquifer because of their similar excellent porosity and permeability. The value of these formations for fresh water storage is described in the section entitled "Water Resources."

The Hawthorn Formation overlies both the Ocala Group and the Suwannee Limestone and is exposed at the surface over much of Hamilton, Alachua, Suwannee and Columbia Counties. The Hawthorne Formation is a marine deposit consisting of thick beds of clay and sandy clay and continuing beds of sandy, phosphatic limestone. It reaches a maximum thickness of about 200 feet in the region and because of its composition and physical characteristics, usually forms a gently rolling surface. The Choctawhatchee Formation lies beneath the surface in northeastern and eastern Alachua County and is exposed only in a few prairies or low areas where overriding sediments have been removed. The formation is comprised of fossiliferous clay and marl and small amounts of phosphate pebbles. Generally equated in age and origin with the Hawthorne Formation is the Alachua Formation. They both have a somewhat similar lithology and despite the relatively small area over which it is exposed, the Alachua Formation is recognized on the map of general geology because of the low grade "hard rock" phosphate deposits occuring within it.

The Alachua Formation forms low rolling hills over the Ocala Group in western Alachua County and small portions of Lafayette and Madison Counties. This formation is primarily a terrestrial sand deposit often found interbedded with phosphate pebbles and sandy clays. The phosphate occurrences in this formation are significant and will be further discussed in the chapter entitled "Rock and Mineral Resources." The Miccosukee Formation, covers much of Taylor County in the northwestern

portion of the region. Deposits of the Miccosukee Formation are composed of yellow-red, cross-bedded, silty and clayey sand that are thought to have been deposited as deltaic sediments during Miocene time.

The fine to medium sand and silts which cover almost the entire region are associated with Recent and Pleistocene terrace sand deposits. These sand deposits are the youngest formations which are recognized in the region. They are collectively comprised of several wave-formed terraces consisting largely of marine sediments which were deposited during the early glacial epoch when most of Florida was under water. Consisting predominantly of unconsolidated sand, with lesser amounts of clay, these sands vary from 20 to 45 feet in thickness over much of the north and eastern portions of the region. They are generally recognized on the geologic map only where they occur in appreciable thicknesses of at least eight to ten feet.

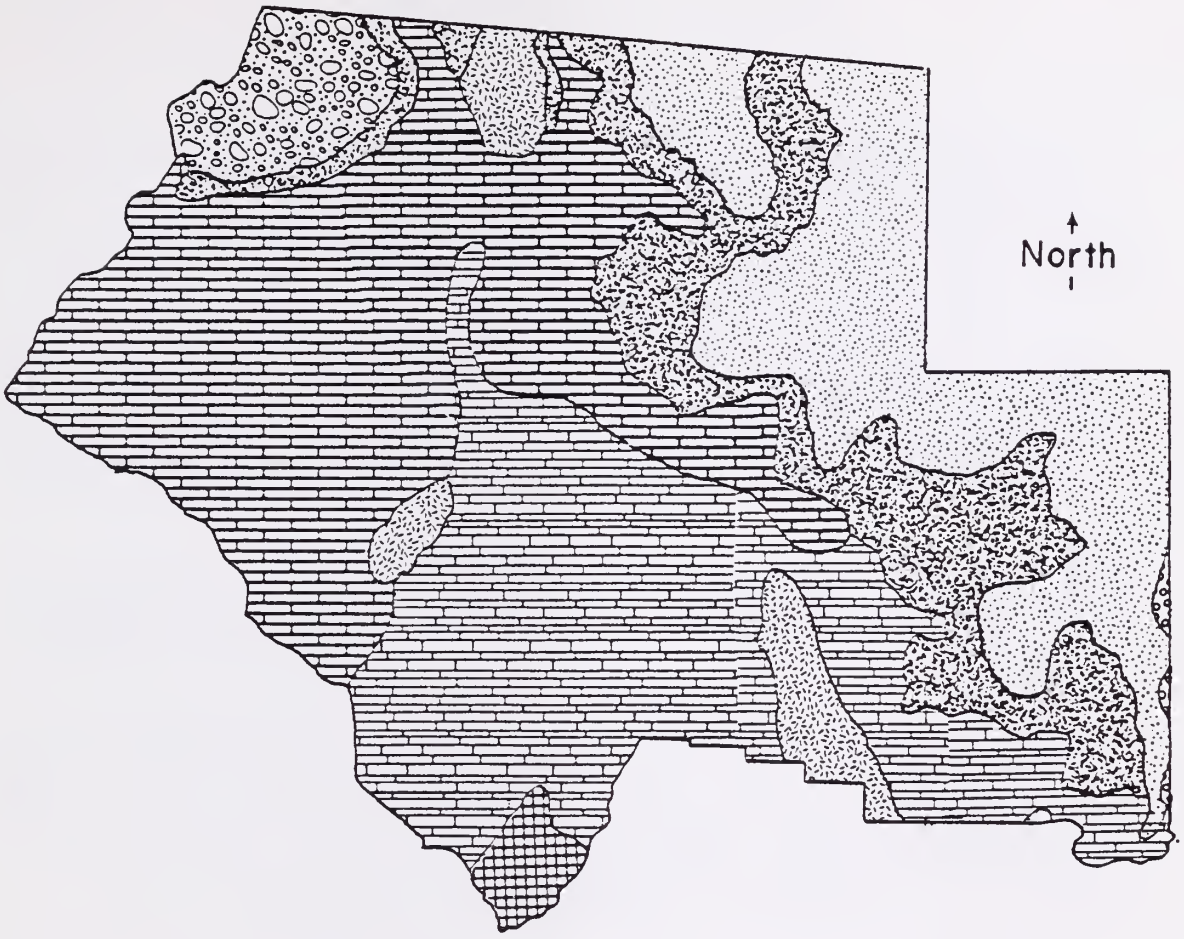
Table 5 that follows, illustrates the time and stratagraphic relationships of these major formations generally recognized in the literature as occuring at or near the earth's surface in north central Florida. The general range of thickness encountered beneath the region is also noted.

TABLE 5
GEOLOGIC TIME AND STRATAGRAPHIC RELATIONSHIPS
OF FORMATIONS IN NORTH CENTRAL FLORIDA

| TIME PERIOD (GEOLOGIC SERIES) | THICKNESS RANGE | FORMATION | |
|---|---|---|---|
| Recent/Pleistocene | 0-50 | Sand terrace deposits | |
| Pliocene | 0-65 | Miccosukee | |
| Miocene | 0-20 | Choctwhatchee | |
| | 0-90 | Alachua | |
| | 0-160 | Hawthorne | |
| Oligocene | 0-100 | Suwannee Limestone | |
| Eocene | 0-140 | Crystal River | |
| | 70-205 | Williston | Ocala Group |
| | 50-70 | Inglis | |
| | 205-525 | Avon Park | |
| | 175-560 | Lake City | |

Source: Adapted from the Geologic Map of Florida, Florida Bureau of Geology, 1964.

# GENERAL GEOLOGIC MAP*




## LEGEND

| SYMBOL | FORMATION | SERIES (AGE) |
|---|---|---|
| | Terrace Deposits | Pleistocene |
| | Miccosukee | Miocene |
| | Alachua | |
| | Fort Preston | |
| | Hawthorne | |
| | Suwannee | Oligocene |
| | Crystal River | Eocene |
| | Williston | |

OLDER

*Source: Geologic Map of Florida, Map Series No. 18, Florida Division of Geology, May, 1965

## GEOLOGIC MAP PREPARATION

The map entitled General Geologic Suitability for Development, represents the approximate areal distribution of rock formations that would be explosed at the earth's surface assuming the thin veneer of soil deposits were removed. The formations mapped are grouped according to common rock types as shown in the legend as they occur from just below the soil zone to depths of expected use for most purposes. Therefore, the map is generalized, based on lithologies to facilitate easier comparison and understanding. The map characterizes geologic formations in terms of materials found from surface exposure, shallow borings and other information and is drawn from the environmental geology maps prepared by the Florida Bureau of Geology and adapted for this comparison.

The broad generalizations relate limitations to development based upon an overview of the physical and chemical character of each rock type. It has been prepared with the assistance of Mr. Michael Knapp, a geologist with the Florida Bureau of Geology.

For the purposes of this report, it is necessary to assign relative values to each formation based upon each element's suitability or sensitivity to a higher intensive land use. The rating scheme is subjective in nature and is based upon a general evaluation of the overall limitations or sensitivity possessed by each formation with regard to its value or potential for more intensive development.

This determination was made basically as follows. Thick sand deposits because of the generally good bearing capacity and excellent drainage capabilities are noted as having the least limitations or restrictions to intensive land use. Although they cover almost the entire region, only areas with relatively thick deposits are identified as having few limitations for more intensive development.

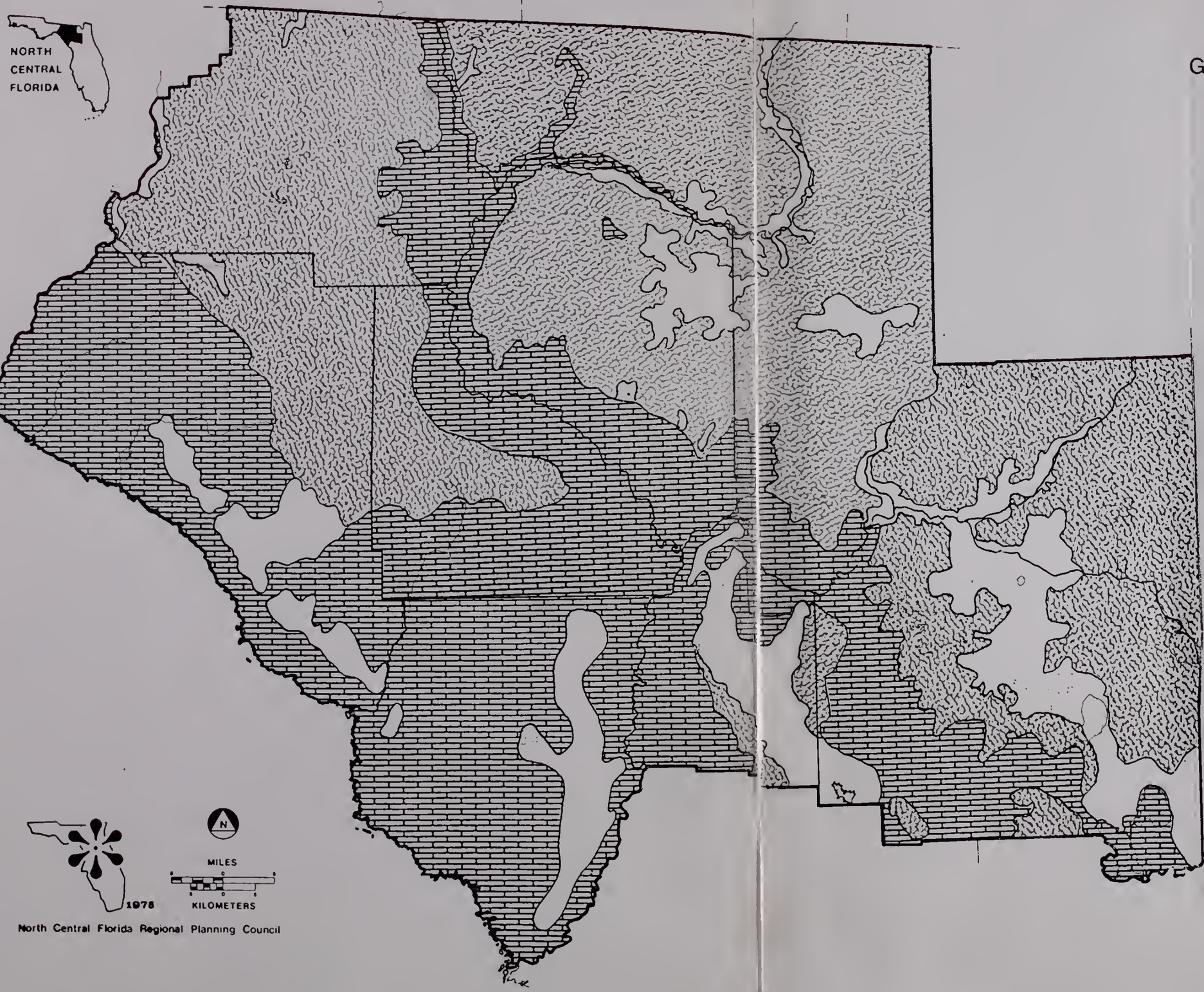
The area corresponding to the areal extent of those formations, which are, in general, the time equivalent of the Hawthorne Formation, contain a prepondernace of sand material. They are, therefore, ranked second only to the sand deposits with respect to suitability or development.

Ongoing studies by the Florida Bureau of Geology have indicated that the Suwannee Limestone is largely dolomite west of the Suwannee River. As dolomite it is more suitable for development than other limestone formations because it presents a hard base rock suitable for foundations and is generally less porous to infiltration due to the recrystalization of the rock making it less prone to solution by ground water such as from septic tanks and other waste discharges.

The Alachua Formation, recognized as the terrestial equivalent of the marine deposited Hawthorne Formation, and lithologically similar, is grouped with the Hawthorne as having moderate development limitations. This categorization is made largely because of the variable nature of these formations which largely consist of interbedded sands, limestones, clays and phosphatic pebbles. Generally, because of their succeptability to swelling by clays and poor percolation resulting in standing water and inadequate operation of septic tanks, they often pose distinct limitations to intensive development.

The limestone formations of the Ocala Group, including the overlying Suwannee Limestone, are assigned highest degree of sensitivity of those formations represented at the surface. This evaluation is based on the degree to which limestone occurring at the surface may restrict construction, particularly underground utilities and, more importantly, on the potential afforded for pollution of the subsurface Floridan Aquifer through this soluble, porous material.

The foregoing discussion does not imply that areas with relatively high limitations should be barred to construction and development, but rather in many cases a greater degree of consideration and possibly extensive investment in material and energy would need to be expended to preclude potential problems and hazards afforded by geologic conditions. Depth of soil overburden above each formation and soil characteristics are only two examples where other factors can effect growth and development or modify the significance of this geologic grouping in any specific area.




# GENERAL GEOLOGIC SUITABILITY FOR DEVELOPMENT

Decreasing Suitability

PLEISTOCENE SAND DEPOSITS (DEEP)

CLAYEY-SANDY MATERIALS

LIMESTONES & DOLOMITES

1978

North Central Florida Regional Planning Council

# WATER RESOURCES

## INTRODUCTION

The freshwater resources of Florida include waters which are stored on the land surface as well as those stored in underground reservoirs. That water stored on the earth's surface in lakes, rivers, canals, reservoirs, and swamps may collectively be termed surface water. Water stored in the permeable rock formations or aquifers lying beneath the earth's surface is termed groundwater. These water resources are continually replenished by rainfall and by incoming flows such as rivers from neighboring states. A reduction in water resources also occurs on a continuous basis through groundwater and river discharges to the ocean, evapotranspiration and human consumption.

Water is a renewable resource, a more accurately, a recyclable resource. It is neither created nor destroyed through its use or its movement through the hydrologic cycle, rather only its character and location are changed. Therefore, at any one time, the basic amount of water in Florida remains relatively unchanged, although population growth and urban and industrial development both continue to put increasing demands on the available supply. While serious water shortages in terms of the entire state appear unlikely, it is certain that in future years, water will not be available in sufficient quantities in each basin or hydrologic area to fully meet the potential demands that will be placed on this resource. Therefore, an analysis of this resource has become a vital function of natural resource planning. The hydrologic problem then, is fundamentally one of water accounting so that a balance of water quality and quantity may be maintained in natural systems.

## SURFACE WATER RESOURCES

### General

From the enclosed drainage basin map, it may be seen that this north central Florida region is divided between three major drainage basins: the

Suwannee, the St. Johns, and the Aucilla-St. Marks. Surface drainage is by far dominated by the Suwannee River, which, with its tributaries, remains the most significant surface water feature in the region.

Abundant lakes and springs are evident throughout the area and contribute to the aesthetic and recreational values of the region. If wetlands, i.e., swamps and marshes, etc., are included, it is apparent that the region is rich with a diversity of surface water resources.

In order to facilitate the assessment of water quality problems, Florida's Department of Environmental Regulation has subdivided each major river basin into basin segments. Each segment is a discreet hydrologic area, or sub-basin, through which water accumulates or passes into the major drainage system. Each segment, as seen on the drainage basin map, has been assigned an identifying number to facilitate identification for planning and processing purposes.

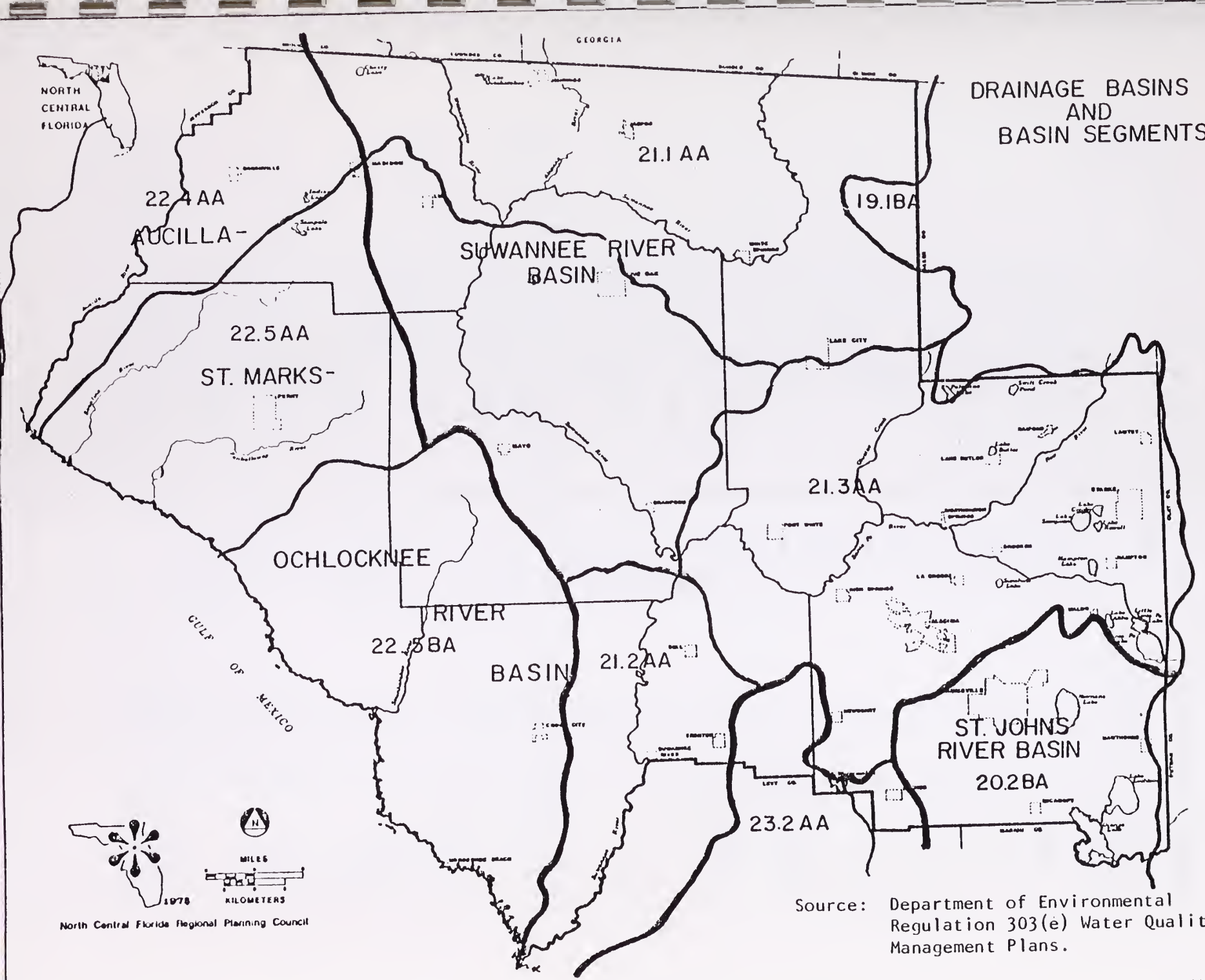
## Drainage Basins

Of those basins that lie wholly or partially within this eleven county region, the Suwannee River basin is the largest. It includes an area of 11,020 square miles of which 4,127 square miles lies in peninsular Florida. All or portions of twelve counties are found within the basin including Alachua, Baker, Bradford, Columbia, Dixie, Gilchrist, Hamilton, Lafayette, Levy, Madison, Suwannee, and Union.

The Suwannee River basin in Florida is characterized by lakes, sinks and permeable underground limestone formations that store and regulate much of the surface runoff before it collects in surface channels. The permeable soils that cover much of the land area in the basin are often underlain by clays and limestones which also affect the amount of runoff that reaches the rivers and streams of the region.

The three largest tributaries of the Suwannee are the Alapaha, Withlacoochee and Santa Fe Rivers. The four are similar in that their channels are fifteen to thirty feet deep and often cut through shallow overburden into underlying limestone formations. The flood plains of each are highly vegetated and generally of high environmental value.

The Suwannee begins in the Okefenokee Swamp in Georgia where numerous channels converge to form the river. From Georgia, it flows in a southly direction forty-five miles to White Springs, Florida. It then forms a wide westward loop picking up its three principal tributaries before continuing southwestward toward the Gulf of Mexico, where it empties a few miles north of Cedar Key, Florida. The average flow for the upper Suwannee River at the farthest upstream gauging station




Source: Department of Environmental Regulation 303(e) Water Quality Management Plans.

TABLE 6
RIVERS & TRIBUTARIES IN THE SUWANNEE RIVER BASIN

| BASIN SEGMENT | STREAM NAME | COUNTY | LENGTH (MILES) | DRAINS SQ MILES |
|---|---|---|---|---|
| 21.1 AA | Alapaha River | Hamilton | 155.0 | 1,840.0 |
| | Alligator Creek | Hamilton | 4.3 | |
| | Apalahoochee River | Hamilton | 30.0 | 283.0 |
| | Camp Branch | Hamilton | 4.3 | |
| | Cypress Creek | Hamilton | 2.2 | |
| | Jerry Branch | Hamilton | 4.0 | |
| | Jumping Gully Creek | Hamilton | 6.7 | |
| | Mill Creek | Hamilton | 2.2 | |
| | Mitchell Creek | Hamilton | 3.9 | |
| | Poncher Branch | Hamilton | 2.1 | |
| | Ratlift Branch | Hamilton | 2.2 | |
| | Rocky Creek | Hamilton | 6.5 | |
| | Sol Marie | Hamilton | 2.8 | |
| | Sugar Creek | Hamilton | 3.5 | |
| | Swift Creek | Hamilton | 6.8 | 58.0 |
| | Tiger Creek | Hamilton | 5.4 | |
| | Turkey Creek | Hamilton | 2.2 | |
| | Withlacoochee River | Hamilton | 115.0 | 2,330.0 |
| | Camp Branch | Columbia | 11.5 | |
| | Carrey Flat Branch | Columbia | 2.0 | |
| | Deep Creek | Columbia | 13.6 | |
| | Falling Creek | Columbia | 13.8 | |
| | Robinson Branch | Columbia | 9.4 | |
| | Tiger Branch | Columbia | 2.8 | |
| | Rocky Creek | Suwannee | 8.1 | |
| 21.2 BA | Blocksnake Creek | Madison | 2.0 | |
| | Norton Creek | Madison | 6.9 | |
| | Springhead Creek | Madison | 1.5 | |
| | Mill Creek | Lafayette | 4.1 | |
| 21.3 AA | Alligator Creek | Bradford | 7.8 | 24.3 |
| | Gum Creek | Bradford | 3.0 | |
| | New River | Bradford | 29.2 | 292.0 |
| | Sampson River | Bradford | 6.3 | 67.8 |
| | Water Oak Creek | Bradford | 14.3 | 20.7 |
| | Butler Creek | Union | 5.0 | 8.0 |
| | Five Mile Creek | Union | 5.0 | |
| | Olustee Creek | Union | 26.6 | 170.0 |
| | Swifts Creek | Union | 16.8 | 58.0 |
| | Cannon Creek | Columbia | 4.8 | |
| | Clay Hole Creek | Columbia | 6.8 | |
| | Rose Creek | Columbia | 6.7 | |
| | *Santa Fe River | | 70.0 | 1,440.0 |
| 21.1 AA | *Suwannee River | | 245.0 | 9,900.0 |

*Rivers border on several counties in the planning basin.

near White Springs is 1,807 cfs (cubic feet per second), while the maximum flow is 28,500 cfs. Approximately thirty miles from the mouth, flows average 10,560 cfs, with a maximum of 84,700 cfs.*

Table 6, summarized from the Suwannee River 303 Basin Plan, identifies the principal rivers and tributaries in the Suwannee River basin.

The St. Johns River basin covers approximately 8,800 square miles of peninsular Florida of which about 490 square miles lie in Alachua County and perhaps five square miles in Bradford County. Drainage to the St. Johns River in Alachua County is through Orange Creek in the southeastern tip of the County which connects to the St. Johns River via the Oklawaha River, its largest tributary. The average flow from southeastern Alachua County into the St. Johns River Basin is approximately 97 MGD.

A very small portion of the region lies within the Southwest drainage basin of Florida or, more specifically, in the Wacassassa River Basin which drains southwestward through Levy County to the Gulf of Mexico at Yankeetown. This area includes approximately 65 square miles in southeastern Gilchrist County and 20 square miles in southwestern Alachua County. The area is not significant from a regional drainage scheme except for the drainage relief offered the poorly drained Wacassassa Flats area of Gilchrist County.

## Lakes

Although lakes are unimportant to the region as sources of public water supply they must be noted as an asset that few states enjoy in more abundance than Florida. Values to outdoor recreation, aesthetics, wildlife propagation as well as the economic benefits afforded from servicing these and other activities insure the continued importance of lakes within the region.

There are 645 lakes in this eleven county region of north central Florida, 78 of which exceed 100 acres in size. These lakes have a total surface area of about 98,821 acres or 154 square miles. Table 7 summarizes the distribution of lakes by county in the region.

Covering a land area of 154 square miles out of the 6,877 square miles in the region (2.23%), lakes obviously constitute an important land use in the region. Therefore, the need for the conservation of this resource is important to both the economy as well as the quality of life.

*Note: A flow of 100 cfs is approximately equal to a flow of 64.6 million gallons per day (MGD).

TABLE 7
LAKES IN PLANNING DISTRICT III*

| COUNTY | TOTAL NUMBER LAKES | NUMBER OF LAKES OVER 100 ACRES | LAKE AREA (ACRES) | LAKE AREA (SQUARE MILES) |
|---|---|---|---|---|
| Alachua | 169 | 40 | 52,068 | 81.356 |
| Bradford | 15 | 7 | 10,055 | 15.710 |
| Columbia | 38 | 3 | 1,405 | 2.195 |
| Dixie | 76 | 1 | 1,608 | 2.512 |
| Gilchrist | 9 | 1 | 437 | .682 |
| Hamilton | 27 | 1 | 658 | 1.028 |
| Lafayette | 66 | 4 | 1,564 | 2.443 |
| Madison | 113 | 12 | 14,487 | 22.635 |
| Suwannee | 33 | 2 | 982 | 1.534 |
| Taylor | 96 | 4 | 13,658 | 21.341 |
| Union | 3 | 3 | 1,899 | 2.967 |
| Total | 645 | 78 | 98,821 | 154.408 |

*See Appendix 3

Source: Florida Gazetteer.

Table 8 provides a tabulation of lakes exceeding 100 acres by basin segment in the region. It is of note that these tables do not include swamps, marshes or other wetlands in the region. As will be seen in following sections, these variable water bodies cover vast portions of the region and contribute greatly to the overall water-bound natural resources of the region.

## GROUNDWATER RESOURCES

Groundwater is the principal source of water supply for industrial, municipal, agricultural and domestic uses in the region. As such it is probably the single most important natural resource available to the citizens of north central Florida. Although its highest function is as a source of potable water, it also serves to maintain water levels

# TABLE 8

LAKES EXCEEDING 100 ACRES IN PLANNING DISTRICT 3

Suwannee River Basin

| SEGMENT | NAME | COUNTY | TYPE |
|---|---|---|---|
| 21.3 AA | Lake Altho | Alachua | 3 |
| | Sanchez Prairie Lake | Alachua | 4 |
| | Mud Swamp | Alachua | 3 |
| | Sunshine Lake | Alachua | 1 |
| | Lake Crosby | Bradford | 1 |
| | Hampton Lake | Bradford | 3 |
| | Little Santa Fe Lake | Bradford | 3 |
| | Lake Powell | Bradford | 3 |
| | Lake Sampson | Bradford | 3 |
| | Santa Fe Lake | Bradford | 3 |
| | Alligator Lake | Columbia | 1 |
| | Palestine Lake | Union | 4 |
| | Swifts Creek Pond | Union | 4 |
| | Lake Cutler | Union | 1 |
| | Unnamed Lake | Alachua | 4 |
| | Unnamed Lake | Alachua | 3 |
| 21.1 AA | Cherry Lake | Maclean | 4 |
| | Lake Octahatchee | Hamilton | 4 |
| | Duval Pond | Madison | 4 |
| | Ogden Lake | Columbia | 2 |
| | Lake Jeffery | Columbia | 4 |
| | Lake Louise | Suwannee | 2 |
| 21.2 BA | Alton Pond | Lafayette | 4 |
| | Peacock Lake | Suwannee | 4 |
| | Tennile Pond | Madison | 1 |
| | Townsend Pond | Lafayette | 4 |

Aucilla - River Basin

| SEGMENT | NAME | COUNTY | TYPE |
|---|---|---|---|
| 22.4 AA | Hixtown Swamp | Madison | 1 |
| | Unnamed Lake | Madison | 2 |
| | Little Aucilla Lake | Madison | 4 |
| | Cobb Pond | Madison | 4 |
| | Johannah Lake | Madison | 3 |
| | Unnamed Lake | Madison | 4 |
| | Rock Island Pond | Madison | 1 |
| 22.5 AA | Sampala Lake | Madison | 4 |
| | Old Grassy Lake | Lafayette | 4 |
| 22.5 BA | Coker Sog | Taylor | 4 |
| | Unnamed Lake | Taylor | 3 |
| | Big Trail Pond | Taylor | 4 |
| | Minor Sog | Taylor | 4 |
| | Unnamed Lake | Lafayette | 4 |

Southwest (Wacassassa) River Basin

| | | | |
|---|---|---|---|
| 23.2 AA | Watermelon Pond | Alachua | 4 |
| | Unnamed Lake | Gilchrist | 4 |

St. Johns River Basin

| | | | |
|---|---|---|---|
| 20.3 EA | Lake Bedford | Bradford | 1 |
| 20.2 CA | Blue Pete Lake | Alachua | 4 |
| 20.2 BA | Bivens Arm | Alachua | 3 |
| | Chacola Pond | Alachua | 2 |

St. Johns River Basin (Cont.)

| SEGMENT | NAME | COUNTY | TYPE |
|---|---|---|---|
| 20.2 BA | Lake Elizabeth | | 2 |
| | Fish Pond | | 4 |
| | Fish Praire | | 4 |
| | Hogtown Prairie | | 4 |
| | Lake Seffords | | 3 |
| | Kanapaha Prairie Lake | | 3 |
| | Lake Kanapaha | | 4 |
| | Ledwith Lake | | 3 |
| | Levy Lake | | 3 |
| | Little Lochloosa Lake | | 3 |
| | Little Orange Lake | | 3 |
| | Lochloosa Lake | | 3 |
| | Lowman Pond | | 1 |
| | Marans Prairie | | 3 |
| | Newnans Lake | | 3 |
| | Orange Creek Camp Lake | | 3 |
| | Orange Lake | | 3 |
| | Paynes Prairie Lake | | 3 |
| | River Styx | | 3 |
| | Saluda Swamp | | 4 |
| | Stanley Prairie | | 3 |
| | Tuscawilla Lake | | 4 |
| | Unnamed Lake | | 3 |
| | Unnamed Lake | | 2 |
| | Unnamed Lake | | 1 |
| | Unnamed Lake | | 3 |
| | Unnamed Lake | | 1 |
| | Unnamed Lake | | 3 |
| | Watson Prairie | | 1 |
| | Wauberg Lake | | 4 |

Note: The four types of lakes identified are:
1. lakes with streams flowing into
2. lakes with streams flowing out
3. lakes with streams flowing into and out of
4. lakes that are landlocked

Source: Gazetter & 303 Basin Plans

in lakes and streams. Where groundwater discharges at ground surface through springs, recreational sites also become possible..

Groundwater is water within the soil zone in which all pore spaces are completely filled with water. An aquifer is defined as a rock formation or material in the zone of saturation that is permeable enough to yield usable quantities of water to wells or springs.

Groundwater may occur under water table (unconfined) or artesian (confined) conditions. In an unconfined aquifer, the water table is the upper surface of the zone of saturation and is free to rise or fall. In an artesian or confined aquifer, the water is confined under greater than atmospheric pressure by overlying, relatively impermeable beds. The water in a well drilled into an artesian aquifer will rise above the base of the confining bed. If the water rises above the land surface, it will flow naturally and may be termed a flowing artesian well. The potentiometric surface of an artesian aquifer is the surface to which water will rise in a tightly cased well that penetrates the aquifer.

Potable water supplies come from two major sources: the Floridan aquifer and what may be termed the upper or secondary aquifers. The upper aquifers are those waters containing rock or sand formations that lie physically above the limestones of the Floridan aquifer. These aquifers usually consist of a water table aquifer found close to land surface in surficial sand or soil deposits. Other secondary aquifers are often found in thin layers of limestone or other porous material lying between the water table aquifer and the Floridan aquifer below.

The water table aquifer is usually comprised of sands of the Pleistocene terrace deposits and the sand and limestone layers at the top of the Hawthorne Formation. The water table aquifer is absent in a 300 square mile area of southwestern Alachua County and extensive areas of the coastal zone in Dixie and Taylor Counties where the limestones of the Floridan aquifer are very close to the surface. The aquifer is thickest in the northern portion of the region where surficial sand beds may reach 100 feet in thickness.

The water table aquifer will generally yield less than 50 gpm (gallons per minute) of flow which is adequate for some domestic and agricultural uses. However, because of local concentrations of iron and tannic acid, most users rely upon the lower aquifers for superior quality water supplies. This aquifer is primarily recharged by rainfall and to a much lesser extent, the movement of water upward from underlying formations.

Secondary aquifers are often artesian, i.e., the water contained within is under pressure and sometimes flows through wells at land surface. Although limited in occurrence, they are principally found in the limestone or sand layers in the lower part of the Hawthorne Formation which covers much of the higher plateau areas of the region. Probably more wells in the region tap the secondary artesian aquifers for potable water

supplies than any other source. In most areas, wells tapping the secondary aquifers do provide flows greater than those from the water table aquifer (up to 200 gpm) and generally are of better quality.

The Floridan aquifer consists of a series of hydrologically connected limestone and dolomite formations. Within this region, the aquifer is composed of the Lake City Limestone, Avon Park Limestone, the Ocala Group of limestones (the Crystal River, Williston and Inglis Formations), the Suwannee Limestone and the permeable sand and limestone beds occasionally found at the base of the Hawthorne Formation.

This aquifer, which extends beneath almost all of Florida and smaller parts of three adjoining states, is recognized as one of the most productive and extensive groundwater bearing formations in the United State and easily transmits and stores more water than any other aquifer in Florida. Depending upon the location and thickness of the aquifer where penetrated, wells drawing from this source are capable of producing prolific supplies of potable water.

The altitude and configuration of the top of the aquifer are controlled by two subsurface geologic structure, the Ocala Uplift and the Peninsular Arch. As described in the chapter on geology, both structures are structural highs which trend northwestward through the region. The Peninsular Arch crests in Alachua, Union, Columbia and Hamilton Counties and the Ocala Uplift crests to the southwest of the Peninsular Arch in Levy, Gilchrist and Alachua Counties. The aquifer is at or near the surface approximately along the crest of both structures and dips away from these crests toward the Atlantic Ocean on the east flank and toward the Gulf of Mexico on the west.

The General Geology map illustrates the areas in the region where limestones of this aquifer occur at or near the earth's surface. The greatest amount of overburden overlying the aquifer appears to be in southeastern Alachua County where the aquifer lies at a depth of about 300 feet. The freshwater bearing zone of the aquifer ranges from about 500 to 1,000 feet in thickness.

It is not possible at this time to ascertain the quantity of recoverable water which may be available from the aquifer in this region. The staff of the Suwannee River Water Management District is currently preparing both a water use plan and a water budget for the Suwannee River District. This information will facilitate making estimates of available water in any area of the region. Based upon observations of municipal, industrial and agricultural uses along with stream discharges, it is apparent that tremendous quantities of water exist beneath the region. Only a fraction of the stored water, however, can be claimed for use. Therefore, although not inexhaustible, the general magnitude of water volume appears to offer few limitations except as might be imposed by a large industry such as phosphate mining. In such instances, the Suwannee River Water Management District or the St. Johns River Water Management District, charged with

regulating consumptive water use within their respective jurisdictions, would evaluate groundwater withdrawals before issuing permits.

The Suwannee River Water Management District has also identified three ways in which recharge to the Floridan aquifer is accomplished. As reported (Source 25) they include:

1) By local rainfall in the central and southeast part of the District where the aquifer is at or near land surface and the confining beds are thin or absent.
2) By downward movement of water from shallower aquifers and from lakes and streams where the confining beds are breached by sinkholes. For example, in western Alachua County and southern Columbia County, the Suwannee and Santa Fe Rivers and Olustee Creek recharge the aquifer through sinkholes when the river levels are above the potentiometric surface of the Floridan aquifer.
3) By downward infiltration of water from the shallower aquifers through the relatively impermeable confining beds where the water levels in the shallower aquifers stand higher than the potentiometric surface of the Floridan aquifer. This type of recharge occurs over wide areas on the higher terraces in the northern part of the District.

The movement of water laterally through the aquifer is generally in a southwesterly direction toward the Gulf and away from areas of recharge. Water recharge areas are under a higher relative potential than in discharge areas, or those of lower potential. Flow, thereby, occurs from one area to another by gravity based upon differences in hydraulic head.

Areas of high potential or recharge in the region include the areas enclosed by the sixty-foot potentiometric contour lines west of the Suwannee River in Madison and Lafayette Counties and the area partially enclosed by the eighty-foot potentiometric contour lines in northeastern Alachua and southeastern Bradford Counties. Additional recharge to the Floridan aquifer occurs in western Alachua County, eastern Gilchrist County and in areas west of the Suwannee River where the lack of overburden permits direct recharge by rainfall. The numerous sinkholes and sinkhole lakes of the region also permit direct recharge to the aquifer. A General Recharge map has been prepared to illustrate the major areas of recharge in the region. These areas are broadly ranked according to the relative recharge capacities of each area.

Because of the importance of this resource the recharge capabilities of the region must be considered during the land use planning process to insure the compatibility of future land uses with recharge potential. From the General Recharge map it may be observed that the highest recharge in the region occurs in areas where the potentiometric levels or pressure heads offer the greatest potential for rapid movement of water from the surface into the aquifer. Perhaps more important, due to

area size are recharge areas where the limestones of the Floridan aquifer are nearest the surface and through sinkholes directly charging into the aquifer. Areas with poorest recharge potential correspond to the areal extent ot the Hawthorne and similar formations which because of their clayey nature almost preclude the flow of water downward to the aquifer.

## Springs

Florida's springs represent the natural overflow from the state's tremendous groundwater storage and circulation system. Their combined flow has been estimated to be about 7 BGD (billion gallons per day) or over nine times the amount of water delivered by public water systems in 1971. Although used to a very limited degree for industry and agriculture, their primary use is recreational. Their abundance in North Central Florida greatly contributes to the natural beauty of the area.

A spring is a natural fountain or supply of water upwelling at the earth's surface through cracks, fissures or caverns whose flow may range from a wet seep to a sizeable stream. Groundwater is discharged from underlying aquifers to springs where the potentiometric surface or pressure head stands higher than the surface water level.

Springs may be classified by the average quantity of water they discharge First magnitude springs discharge flows of 100 cfs (64.6 MGD) or greater, second magnitude springs have flows between 10 and 100 cfs and third magnitude springs less than 10 cfs.

In a recent report, the U.S. Geological Survey reported that there were a total of 27 first magnitude springs and spring groups in Florida, seven of which are located in this eleven county region. In addition, the region also possesses twenty-six second magnitude springs. Table 9 is provided to illustrate the distribution of springs within the region. Average flows in CFS are given for first magnitude springs.

In addition to those noted, there remain a number of unlisted third magnitude springs in north central Florida. Viewed as whole, the region possesses an impressive number and diversity of springs which constitute one of its most important natural assets.

TABLE 9
FIRST AND SECOND MAGNITUDE SPRINGS OF NORTH CENTRAL FLORIDA

| COUNTY | NAME | FLOW* AV. CFS |
|---|---|---|
| Alachua | Hornsby Spring | 163 |
| | Poe Springs | |
| Columbia | Ichnatucknee Springs | 358 |
| | Bell Springs | |
| Dixie | Copper Springs | |
| Gilchrist | Blue Springs | |
| | Ginnie Spring | |
| | Hart Springs | |
| | Rock Bluff Springs | |
| | Sun Springs | |
| Hamilton | Morgan's Spring | |
| | White Springs | |
| | Alapaha Rise | 608 |
| | Holton Spring | 288 |
| Lafayette | Allen Mill Pond Spring | |
| | Blue Spring | |
| | Fletcher Spring | |
| | Mearson Spring | |
| | Owens Spring | |
| | Ruth Spring | |
| | Troy Spring | 166 |
| | Turtle Spring | |
| Madison | Blue Spring | 123 |
| | Suwanacoochee Spring | |
| Suwannee | Branford Spring | |
| | Chalres Spring | |
| | Ellaville Spring | |
| | Falmouth Spring | 157 |
| | Little River Springs | |
| | Peacock Springs | |
| | Running Springs | |
| | Suwannee Springs | |
| | Tilford Springs | |

*Flow: Average values given for first magnitude springs

Source: Index to Springs of Florida, Florida Bureau of Geology, USGS Spring Tabulation, December, 1975.

# GENERAL RECHARGE

GENERALLY LOW RECHARGE EXCEPT IN SINK AREAS (RELATIVELY DEEP OVERBURDEN)

LOW TO MODERATE RECHARGE POTENTIAL (RELATIVELY THIN OVERBURDEN)

MODERATE TO HIGH RECHARGE POTENTIAL (LIMESTONE AND DOLOMITE NEAR SURFACE)

HIGH RECHARGE POTENTIAL (POTENTIOMETRIC HIGH)

Increasing Recharge Potential

MILES

KILOMETERS

1978

North Central Florida Regional Planning Council

# WATER QUALITY MANAGEMENT

## Water Quality Overview

Water in the Floridan aquifer is usually higher in hardness and has low values of turbidity and color. Iron concentrations are often high as are bicarbonates and sulphate concentrations, although the two latter values may vary greatly. Variations in water quality wihtin the aquifer are due primarily to natural factors with the concentration of dissolved substances generally increasing progressively with depth. The chemical quality of the upper aquifers is generally more variable with the most objectionable quality characteristics being iron, calcium and magnesium hardness and nitrate in some localities. Color is not usually a problem in the upper aquifers; however, it may be significant locally.

In terms of water quality, groundwater in the region is generally considered to be excellent. In only a few areas has groundwater been found to be of an objectionable quality because of excessive mineral concentration or bacteriological contamination. In broad overview, groundwater has been found to be suitable for municipal, agricultural and most industrial uses of the region. The only area in the region where the water in the upper part of the aquifer has been found to be relatively high in mineral concentration is at the mouth of the Aucilla River in southern Jefferson and Taylor Counties. In this area, dissolved solids concentrations of the water has exceeded 1,000 milligrams per liter, chloride has reached 1,000 milligrams per liter and the sulphate concentrations lie between 50 and 100 milligrams per liter. This relatively high concentration of minerals indicates the presence of saltwater intrusion to the aquifer at this locality.

Table 10 is included in order to summarize the utilization of fresh water by the counties in the region. It is noted that virtually all the public and industrial supplies of water tap groundwater sources and most of that is from the Floridan aquifer. The large quantities of groundwater utilized for industrial purposes in Taylor and Hamilton Counties are primarily used in the manufacturing of cellulose and for the mining and processing of phosphate, respectively. Other major industrial uses include thermoelectric generation plants in Suwannee County.

## Water Quality Factors

Although the region remains rich in high quality waters, it is important to recognize that the continuing existence of such surface and groundwater resources is not necessarily assured with growth and development.

TABLE 10
FRESHWATER WITHDRAWN AND CONSUMED IN NORTH CENTRAL FLORIDA

| COUNTY | MUNICIPAL | | INDUSTRIAL | | AGRICULTURAL | | POWER GENERATION | | TOTAL ALL USES | |
|---|---|---|---|---|---|---|---|---|---|---|
| | WITH-DRAWAL | CON-SUMED | WITH-DRAWAL | CON-SUMED | WITH-DRAWAL | CON-SUMED | WITH-DRAWAL | CON-SUMED | WITH-DRAWAL | CON-SUMED |
| Alachua | 22.3 | 12.2 | 1.4 | .3 | 3.4 | 2.5 | 1.0 | .8 | 28.1 | 15.8 |
| Bradford | .7 | .4 | 1.4 | - | .14 | .1 | .2 | .2 | 2.44 | .7 |
| Clay | 1.6 | .5 | 1.5 | .2 | 4.1 | 3.0 | - | - | 7.2 | 3.7 |
| Columbia | 1.7 | .4 | - | - | .2 | .2 | - | - | 1.9 | .6 |
| Dixie | .4 | .1 | .9 | .3 | .09 | .1 | - | - | 1.39 | .5 |
| Gilchrist | .1 | .1 | - | - | .2 | .1 | - | - | .3 | .2 |
| Hamilton | .5 | .2 | 18.4 | 6.1 | .7 | .5 | - | - | 19.6 | 6.8 |
| Lafayette | .1 | .1 | - | - | 1.1 | .9 | - | - | 1.2 | 1.0 |
| Madison | .6 | .1 | - | - | 1.7 | 1.3 | - | - | 2.3 | 1.4 |
| Suwannee | .6 | .2 | 7.1 | .3 | 4.1 | 3.0 | 173 | 1.5 | 184.8 | 5.0 |
| Taylor | 1.2 | .3 | 53.7 | 5.4 | .1 | .1 | - | - | 55.0 | 5.8 |
| Union | .1 | .1 | .6 | .3 | .11 | .1 | - | - | .81 | .5 |
| TOTALS | 29.9 | 14.7 | 85.0 | 12.9 | 16.34 | 11.4 | 174.2 | 2.5 | 305.98 | 42.0 |

Source: Adapted from Water Resource Information Needs, Information Circular No. 1, Suwannee River Water Management District, 1975

The application of water quality and management programs is, therefore, essential if the region's potential is to be achieved.

With respect to assessing the quality status of waters within the region it has been recognized that very little documented information is available concerning the region's existing and potential water quality problems. The 303(e) Basin Plans prepared by Florida's Department of Environmental Regulation appear to summarize the most up-to-date and complete information available. This and other available information suggests that there does exist a high potential for water pollution in large areas of the region and that the existing and/or potential problems are complicated by the type and variety of natural environments present.

Both the ground and surface waters of the region presently receive waste products from a variety of sources including domestic waste from municipal and private dischargers, industrial wastes and non-point sources. The Florida Department of Environmental Regulation has analyzed available water quality data for major lakes and streams of the region and documented this data in their St. Johns River, Suwannee River, and Aucilla-St. Marks 303(e) River Basin Plans, according to requirements outlined by the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500).

Illustrated by the following Basin Segment-water Quality Map are those segments in the northwest and southeast portions of the region designated as Water Quality Limited, or those areas which, on the application of the best practical treatment for industrial point sources and secondary treatment for municipal point sources, will not achieve the established water quality goals. All other segments in the region have been designated in the 303(e) basin plans as Effluent Limited, or those segments in which, upon the levels of treatment mentioned above are expected to meet water quality goals.

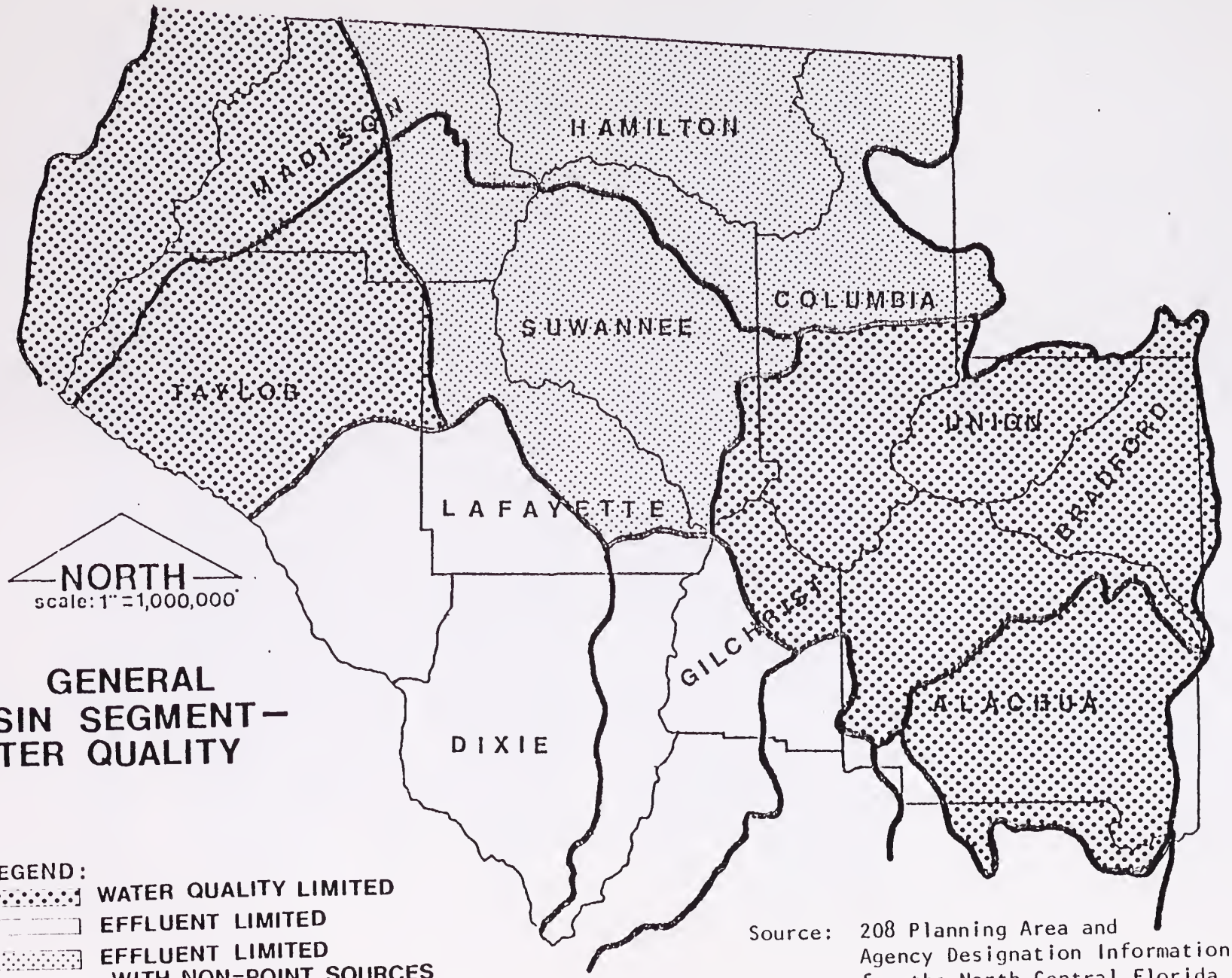
Problems in Water Quality Limited segments as indicated by Table 11, Stream Classification in Water Quality Limited Segments, are due to both point and non-point sources. Water bodies in the southeastern portion of the region having water quality problems include New River, Santa Fe River, Alligator Creek, Newmans Lake, Orange Lake and many others. Many of these have been noted in the past as having high scenic and recreational values. In the northwest portion of the region, Water Quality Limited segments include problems associated with the Aucilla River and the Fenholloway River; the former highly scenic with primarily non-point problems, the latter receiving large amount of industrial wastes which ultimately flow into the Gulf of Mexico.

The north central portions of the region, segments 21.1AA and 21.2BA, have been designated Effluent Limited. This area, drained entirely by the Suwannee River and its tributaries, has been noted by the District Conservationists of the Soil Conservation Service as having potential for non-point sources of pollution. The potential for impacts to ground-water recharge in this area and subsequent downstream impacts throughout the Suwannee River Basin have wide implications with respect to water quality and land use.

TABLE 11
STREAM CLASSIFICATION IN WATER QUALITY LIMITED SEGMENTS

| STATE PRIORITY RANKING (REGIONAL) | STREAM SEGMENT | STREAM CLASSIFICATION* | PRELIM - PROBLEM EVALUATION |
|---|---|---|---|
| 11 (1) | 20.2 BA | Water Quality Limited | |
| | Hogtown Creek | Phosphate, Coliform, D.O. | Effluent discharges, urban runoff |
| | Newnans Lake | Nitrogen, Phosphate, Chlorophyll, D.O. | Runoff, septic tanks |
| | Glen Springs | Nitrogen, Phosphate, D.O. | Natural runoff |
| | Bivens Arm | Phosphate, Chlorophyll | Agricultural & urban runoff |
| | Orange Lake | Nitrogen, Phosphate, D.O. | Agricultural runoff |
| | Insufficient data on other water bodies - monitoring priorities established | | |
| 16 (3) | 22.5 AA | Water Quality Limited | |
| | Econfina River | Nitrogen, Phospate, D.O. | Agricultural runoff |
| | Fenholloway River | Nitrogen, Phosphate, Coliform, D.O. | Industrial & municipal discharges |
| 53 (2) | 21.3 AA | Water Quality Limited | |
| | Santa Fe River | Phosphate, D.O. | Two point sources, agricultural & natural runoff |
| | Lake Rowell | Nitrate, Phosphate, Coliform | Municipal effluent |
| | New River | Nitrate, Phospate | Municipal effluent |
| | Olustee Creek | Phosphate, D.O. | Agricultural & natural runoff |
| | Swift Creek | Nitrogen | Natural runoff |
| | Alligator Lake | Nitrogen, Phosphate, Algae | Domestic effluents, agricultural & natural runoff |
| 111 (4) | 22.4 AA | Water Quality Limited | |
| | Aucilla River | Nitrogen, Biological Index, D.O. | Natural & agricultural runoff |

*Parameters listed are noted at unacceptable levels by the Florida Department of Environmental Regulation in specific 303(e) Basin Plans.




# GENERAL BASIN SEGMENT— WATER QUALITY

LEGEND:

- WATER QUALITY LIMITED
- EFFLUENT LIMITED
- EFFLUENT LIMITED WITH NON-POINT SOURCES

Source: 208 Planning Area and Agency Designation Information for the North Central Florida Region, 1976.

Coastal areas in segments 22.5BA and 21.2AA, likewise, are reported to have non-point sources of pollution though none have yet been specifically identified or quantified. In this area having minimal overburden above the aquifer, there is a close interaction between ground and surface waters, a condition common throughout much of the region. In addition, relatively undeveloped and ecologically valuable coastal marshes and attendant Class II waters are present, all of which would suggest and emphasize the need for water quality management and planning.

The following discussion expands upon point and non-point pollution problems within the region.

## Point Sources

The Florida Department of Pollution Control classified the bulk of the region's surface waters as Class III (recreational-propagation and management of fish and wildlife) and Class II (shellfish harvesting) for coastal waters. The only exception is the Fenholloway River, which is noted as Class V (navigation, utility and industrial uses). Water quality standards for each class of water are identified in Chapter 17-3 of the Rules of the Department of Air and Water Pollution Control. In addition, Federal regulations, i.e. PL 92-500, the Federal Water Pollution Control Act Amendments of 1972, also state as their goal swimmable and fishable waters throughout the nation by 1985 and require through more specific state compiled 303(e) plans more specific goals designed to achieve these standards.

Stream segments which are in violation of water quality standards and which would not meet water quality standards with the application of best practical treatment to point sources are classified as Water Quality Limited. Table 11 summarizes the Water Quality Limited segments within the north central Florida region and notes the probable causes of deteriorated stream quality as suggested by the 303(e) Basin Plans.

In order to document the number and nature of point discharges within the region, Tables 12 and 13 are also provided. It is apparent that only in segments 20.2BA, 21.3AA, and 21.1AA are point source discharges notably significant. There are 35 point source discharges of domestic waste within the region. These sources contribute approximately 13 MGD of effluent to surface waters and are by volume concentrated in segments 20.2BA, 22.5 AA, and 21.3AA. It is of note that several domestic point sources discharge directly into groundwaters and others, notable in and around Alachua County, ultimately flow through surface streams into groundwater bearing formations through solution features.

Industrial point source dischargers are less notable in numbers but perhaps more significant in terms of waste volumes produced. Over 70 MGD

TABLE 12
SUMMARY OF POINT SOURCE DISCHARGERS

| SEGMENT | SEGMENT CLASSIFICATION | DOMESTIC W/DISCHARGE TO | | INDUSTRIAL W/DISCHARGE TO | | DISTRICT III TOTAL |
|---|---|---|---|---|---|---|
| | | SURF. WATERS | OTHER | SURF. WATERS | OTHER | |
| 20.2 BA | WQL* | 15 | 32 | 1 | 4 | 52 |
| 21.3 AA | WQL | 10 | 17 | 3 | 5 | 35 |
| 22.5 AA | WQL | 1 | 1 | 2 | 0 | 4 |
| 22.4 AA | WQL | 1 | 4 | 0 | 0 | 6 |
| 21.2 BA | EL** | 1 | 1 | 2 | 0 | 4 |
| 21.1 AA | EL | 6 | 20 | 3 | 1 | 30 |
| 20.2 AA | EL | - | - | - | - | - |
| 21.2 AA | EL | 0 | 8 | 0 | 0 | 8 |
| TOTAL | - | 35 | 83 | 11 | 10 | 140 |

*Water Quality Limited

**Effluent Limited

Source: Suwannee River, St. Johns River and Aucilla-St. Marks 303(e) Basin Plans.

TABLE 13
SUMMARY CHART OF MAJOR POINT SOURCE DISCHARGERS

| SEGMENT | NAME | LOCATION | WASTE | VOLUME (MGD) (AVERAGE) |
|---|---|---|---|---|
| 20.2 BA | General Electric Battery Plant | Alachua | Alkaline | 0.5 |
| | Copeland Sausage | Alachua | Meat Processing | 0.879 |
| | Regional Utilities Board (3) | Gainesville | Domestic | 7.8 |
| | University of Florida | Gainesville | Domestic | 2.4 |
| | Sunland Training Center | Gainesville | Domestic | 0.3 |
| 21.1 AA | Owens-Illinois | Clyattville, Georgia | Pulp & Paper Processing | 11.7 |
| | City of Jasper | Jasper | Domestic | 0.311 |
| | Occidental Chemical | White Springs | Phosphate Processing | -- |
| 21.2 BA | City of Live Oak | Live Oak | Domestic | 0.4 |
| | Fla. Power Corp. | Live Oak | Cooling water | 175.6 |
| | Gold Kist Poultry | Ellaville | Processing | 0.8 |
| 21.3 AA | E.I. Dupont | Starke | Heavy mineral Mining | 3.4 |
| | Fla. State Prison | Raiford | Domestic | 1.27 |
| | City of Lake City | Lake City | Domestic | 2.0 |
| | City of Lake Butler | Lake Butler | Domestic | 0.22 |
| | City of Starke | Starke | Domestic | 0.8 |
| 22.5 AA | City of Perry | Perry | Domestic | 1.0 |
| | Buckeye Cellulose | Foley | Pulp Processing | 55.8 |
| | Southern Dolomite | Perry | Groundwater and Suspended Fines | 15.0 |

Source: Suwannee River, St. Johns River and Aucilla-St. Marks 303 (e) Basin Plans prepared by the Department of Environmental Regulation.

of wood pulp processing and dolomite mining wastes flow into the Fenholloway River and another 12 MGD from a paper processing source flows into the Suwannee River via the Withlacoochee River in Hamilton and Madison Counties. Both contribute to water quality problems in their respective receiving waters. Less significant is an additional 176 MGD of effluent flowing into the Suwannee River from an electrical power generation facility.

Table 13 presents a summary of the major point source dischargers in the region and notes their general location, waste type and volume. However, this information may not present a factual picture of actual point source problem areas. It must be recognized that even relatively small point source dischargers can significantly aggravate a pollution problem. Consequently, in the absence of a regional water quality assessment, it is only possible to represent major point sources which may or may not necessarily include all significant point sources.

## Non-Point Sources

Very limited information is available on non-point sources of pollution for areas within north central Florida except for those identified in the Department of Environmental Regulation 303(e) Basin Plans. Additional information has been compiled by the District Conservationists of the Soil Conservation Service for each county in Florida. This information consists of a tabulation of land uses that could contribute to potential non-point sources of pollution in each county. Although compiled on a county by county basis and not by basin segment, the information presents data from which it is possible to assess potential or undocumented non-point problems within the region. County maps have also been prepared by District Conservationists which identify potential sources of non-point pollution.

Table 14 suggests that potential non-point pollution from urban runoff may be most significant in Alachua and Suwannee Counties which have the largest urban concentrations. The potential for the majority of non-point problems, as suggested by Table 14, appears perhaps greatest from agriculture and forest land uses. The use of fertilizers, pesticides and other supplementary material as well as the often large scale land alterations associated with these activities occupy an extensive area in the region. This suggests that significant non-point pollution sources may exist. Documentation of such sources is difficult owing not only to the rural nature of the region but also to the relative absence of surface drainage systems in large areas of karst topography which permits the rapid movement of surface waters into groundwater systems. In summary, in areas such as north central Florida, typified by Karst topography and dotted by solution features, surface and groundwater interactions are an exceptionally important consideration in assessing

TABLE 14
NATURE OF NON-POINT SOURCES BY COUNTY

| SOURCE | UNITS | REGION | ALACHUA | BRADFORD | COLUMBIA | DIXIE | GILCHRIST | HAMILTON | LAFAYETTE | MADISON | SUWANNEE | TAYLOR | UNION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Acreage | Acres X 1000 | 4296.80 | 617.6 | 192.6 | 505.0 | 453.8 | 222.7 | 329.6 | 352.6 | 453.1 | 439.7 | 673.3 | 156.8 |
| Surface Waters | Acres X 1000 | 60.70 | 31.6 | 4.7 | 3.1 | 10.6 | 1.1 | .5 | 1.5 | 3.3 | .8 | .9 | 2.6 |
| Beef Cattle | X 1000 | 105.20 | 47.2 | 8.6 | 22.9 | 4.9 | 14.6 | 9.3 | 10.1 | 23.1 | 41.7 | 5.4 | 7.4 |
| Dairy Cattle | X 1000 | 8.10 | 1.2 | .0 | .0 | .0 | .4 | .0 | 4.5 | .4 | .4 | .0 | 1.2 |
| Hogs | X 1000 | 91.34 | 15.4 | 1.5 | 14.0 | 1.9 | 5.4 | 10.8 | 8.4 | 29.9 | 1.47 | .87 | 1.7 |
| Poultry | X 1000 | 1890.00 | 367.0 | 485.0 | 504.0 | 25.0 | 25.0 | 30.0 | 25.0 | 107.0 | 125.0 | 25.0 | 172.0 |
| Citrus | Acres X 1000 | 0.00 | .0 | .0 | .0 | .0 | .0 | .0 | .0 | .0 | .0 | .0 | .0 |
| Vegetables | Acres X 1000 | 15.50 | 5.9 | .5 | .6 | .3 | 3.6 | .3 | .3 | 1.1 | 2.3 | .3 | .3 |
| Field Crops | Acres X 1000 | 208.00 | 51.5 | 1.4 | 25.9 | .7 | 15.6 | 22.0 | 7.0 | 26.5 | 51.4 | .7 | 5.3 |
| Sugarcane | Acres X 1000 | 0.00 | .0 | .0 | .0 | .0 | .0 | .0 | .0 | .0 | .0 | .0 | .0 |
| Silviculture | Acres X 1000 | 3214.90 | 311.4 | 148.1 | 389.4 | 393.6 | 150.8 | 253.3 | 294.9 | 323.9 | 204.2 | 611.5 | 133.8 |
| Urban | Acres X 1000 | 132.50 | 46.9 | 15.4 | 16.0 | 4.2 | 5.6 | 11.5 | 1.3 | 6.6 | 4.8 | 11.9 | 8.3 |
| Total Population | X 1000 | 215.50 | 105.0 | 14.6 | 25.3 | 5.5 | 3.6 | 7.8 | 2.9 | 13.5 | 15.6 | 13.6 | 8.1 |
| Population Density | People/acre | -- | .18 | .08 | .05 | .01 | .07 | .02 | .01 | .03 | .04 | .02 | .05 |
| Annual Rainfall | Inches | -- | 52.7 | 52.7 | 52.7 | 52.7 | 52.7 | 52.7 | 52.7 | 52.7 | 52.7 | 52.7 | 52.7 |

Source: Data compiled by District Conservationists for the Florida Soil Conservation Service, 1970.

water quality. Any solution feature that receives runoff becomes a potential source of pollution and, as most surface water bodies within the region terminate or interact with solution features, the potential for deterioration of groundwater supplies is almost always present.

Potable water supplies in north central Florida draw almost exclusively upon groundwater resources. Anticipated growth and development in the region, and in particular, areas of aquifer recharge having minimal overburden, require a continually high water quality from the Floridan and upper aquifers. Complete reliance on point source control cannot, therefore, be expected to fully achieve the maintenance or enhancement of desirable water quality in the region. It is, therefore, in the best interest of present and future citizens of the region for the North Central Florida Regional Planning Council to pursue funding for programs such as 208 Areawide Waste Water Management Planning program provided for in PL 92-500, to insure local preparation of plans vitally important to water supplies of the region.

## Flood Plains

Flood plains, although perhaps not easily identifiable as natural resources, are an important if not indivisible part of our natural surface water systems. They often correspond to a broad belt surrounding the existing stream channels or isolated depressions and are shaped in part by topography, storm water volume, vegetation and other natural and manmade forces.

Flood plains commonly include all those areas, including depressions that are inundated following a storm whose severity is often judged by the water levels which could be expected following a storm of a certain stated rainfall intensity. They are usually defined as that area which is inundated as a result of a rainfall whose magnitude and duration occurs on the average only once in each one hundred years. For comparison, stream channels are often defined by that area which is inundated by a storm which occurs on the average once in every ten year period.

Flood plains provide valuable services if left in a natural state. They not only provide flood ways to remove storm waters, but when not satisfying this prime function, they may also provide useful open space areas near urban centers. In addition, wildlife may find refuge in vegetation often naturally abundant near well watered areas, groundwater recharge occurs through soils during high water levels, and recreation is often enhanced in naturally viable settings.

Due to the relative infrequency of major storms and the benefits afforded by a gently sloping topography, development in and around flood plains often appears highly feasible. However, the potential for human and economic loss is usually increased. Areas with a naturally high flood potential cannot tolerate continued development which in effect would retard the ability of the flood plain to absorb water and restrict the flow of water from the land. Flood volume and velocity are increased downstream by development within flood plains causing downstream flood hazards to increase. The construction of storm sewers, canals and other stream channel improvements may greatly alleviate potential flooding problems in urban areas. However, as evidenced by recent drainage studies for the Gainesville Urban Area, downstream flooding problems may be intensified by increasing the amount and rate of flood waters flowing into stream channels. Therefore, proper management of flood plain areas is particularly important in urbanizing areas to insure against serious property damage and loss of life.

It has been reported that the most severe floods in the Suwannee River Basin are associated with storms or sequences of storms which produce widespread rainfall over a period of several days. Although flooding may occur in any season, the maximum annual flood stages most frequently occur during the period from February to April as a result of frontal type rainfall events. Major storms may also occur during the summer and fall months associated with tropical disturbances such as hurricanes. The coastal area of Dixie and Taylor counties is notably susceptible to tidal flooding as a result of such storms.

The largest storm of record for the Suwannee River Basin occurred in March and April, 1948. A series of storms in the basin coupled with high groundwater conditions served to maximize runoff to the river. During peak stages of the resulting flood, the Suwannee flowed out of its banks from the Gulf north beyond the Florida state line. The flooded area covered almost 500 square miles along the river and its tributaries and damaged many homes and commercial establishments within the flood plain. More recently, another flood occurred in April, 1973, which produced flood stages as high or higher than the 1948 flood in the upper reaches of the Suwannee. Stages on the lower reaches were about three feet lower than in 1948. There was an estimated eight million dollars in damages to homes, businesses and roads from this more recent storm.

Tidal flooding also has the potential of doing extensive damage, particularly along coastal areas in the region. Most of this type of flooding is the result of hurricanes near the coast in such a direction as to cause on-shore winds for several hours. The Corps of Engineers has projected tides as high as fourteen feet above mean sea level for a 100-year frequency storm for coastal areas in Dixie and Taylor counties. Certainly flood plain planning is not to be neglected in terms of the extent of flooding that may occur during a major storm event.

An estimate of the extent of flood prone areas within the Suwannee River Water Management District is furnished in Volume I of the Northeast Gulf River Basin Study for Florida, Alabama and Georgia prepared by the

U.S. Department of Agriculture in cooperation with state agencies. Of the 4,403,398 acres in the basin, approximately 45.4% or 2,000,000 acres lie within flood prone areas. It is noteworthy that of this amount 10,142 acres or 0.5% consist of urban and built up areas.

To help define such areas, generalized flood plain maps have been prepared by the U.S. Geological Survey on the 7-1/2 minute topographic quadrangle maps for all counties of the region. In addition, the Federal Flood Insurance Administration of the Department of Housing and Urban Development has prepared Flood Hazard Boundary Maps for many communities within the region. This series is being continually updated as new areas elect to participate in the Federal Flood Insurance Program which offers low cost flood insurance to those communities which make at least modest efforts toward establishing flood plain and development regulations.

A general flood prone area map has been prepared and is included in this report. This map has been compiled from the over 200 U.S. GS 7-1/2 minute flood prone area maps of the Region. It shows only those areas identified as lying completely within the boundaries of the statistical 100-year flood. It is readily apparent that such areas possess at the least moderate limitations to development. In addition to these flood prone areas idenfitied, the region also contains lands having numerous indistinct flood prone and dry areas where it was estimated that up to one half of the land area under consideration could be defined as flood prone. These areas are not defined on the general flood prone area map but could be important to development in specific areas. Notable occurrances of such areas may be seen in the coastal areas of Dixie and Taylor Counties, the swamp areas of northern Columbia and eastern Hamilton Counties, and the low lying areas of central Bradford County.

## Wetlands

Wetlands may be identified as those areas where the water table is at, near, or above the land surface for a significant part of most years. They may be broadly classified as either marine or non-marine environments and include springs, rivers, flood plains, swamps, meadows, ponds, lakes, salt marshes, estuarines, bays, coral reefs, submarine meadows, and a variety of other environments.

All to often in past years, wetlands, typifed by swamps and coastal marshes of either fresh or salt water, were regarded as worthless land suitable only for land filling or if properly channelized and drained, for agricultural uses. In recent years, the natural values of these wetlands have been investigated by a number of researchers and found to be tremendously important to the maintenance of natural systems.

One product of the 1972 Florida Wildlife Federation Legislative Conference

NORTH CENTRAL FLORIDA

# AREAS SUBJECT TO 100 YEAR FLOOD

FLOOD HAZARD AREAS

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was a statement recognizing the value and importance of the state's wetlands. Wetlands were recognized as important for:

1) The protection of aquatically dependent vegetation and wildlife;
2) The propagation of food supplies.
3) The maintenance of protective barriers against floods, hurricanes, and other storms and for the prevention of erosion of shorelines and shores;
4) The assimilation of pollutants;
5) The prevention of salt water intrusion in coastal areas;
6) Their value of surface water storage and recharge areas;
7) The moderation of local climate;
8) Their potential to provide present and future citizens with an acceptable quality of life including historic and recreational values and aesthetic enjoyment.

In addition, the conference concluded that the protection and proper management of wetlands is necessary to ensure the economic well being of the state and the health, safety and welfare of its citizens.

Many valuable wetland areas have been identified in north central Florida. Examples include Gumroot Swamp in Alachua County, Santa Fe Headwater Swamp in Bradford County, Hixtown Swamp in Madison County, California Swamp in Dixie County and Tide Swamp in Taylor County. Like many other wetlands, these serve as valuable natural filters for urban runoff, reservoirs of abundant vegetation and wildlife and serve many valuable natural functions. The environmental quality analysis for the coastal zone of Dixie and Taylor County prepared by the Council also identified the extensive coastal marshes and estuary areas along the Gulf Coast of Dixie and Taylor Counties also as being of considerable natural significance.

In order to incorporate such areas into the planning process, wetland systems within the region have been identified by a General Wetlands Map. The information contained on this map is generalized because of data limitations and the broad scale at which the map was prepared. While specific systems are named in the environmental inventory section of this report, it is noted that the basic information was drawn from the 1:125,000 scale maps of land use prepared on behalf of the Division of State Planning by NASA personnel utilizing satellite imagery techniques. Land use maps for the region were prepared or modified for in-house use utilizing aerial photographs of the region for comparison. Wetland areas were identified and transferred to a regional map at a scale of 1:250,000 to achieve a common basis for comparison with other maps of natural systems.

Areas not identified as wetlands on the map may be assumed to be generally dry land. Because of the nature of the region with its many small swamp areas it is not possible to indicate every discreet wetland parcel. Therefore, the map must be considered general in nature.

# WETLANDS

WETLANDS

MILES

KILOMETERS

1978

North Central Florida Regional Planning Council

Based upon an evaluation of wetland importance and potential it has become apparent that land use planning and subsequent development should consider such concepts of wetland ecology and resources as a viable element in the planning process. Local governments may find it desirable to communicate with the Florida Freshwater Fish and Game Commission as well as other environment related agencies in order to provide themselves with the ability to fully access each wetland system with respect to its natural attributes and importance to other related systems.

## Water Resource Projects

The Soil Conservation Service, the U.S. Army Corps of Engineers and private power companies have ongoing water resource projects throughout the state, a number of which exist within this planning region. Some of these projects are complete while others are in various stages of planning and construction.

Since 1894, the major part of the Corps of Engineers' activities has been with navigation and harbor projects. The USDA, Soil Conservation Service, is actively participating in water resource projects through the PL 566 Small Watershed Program. Twenty-nine projects of this type have been applied for in Florida. In addition, Resource Conservation and Development (RC&D) projects are also the work of the U.S. Department of Agriculture, Soil Conservation Service. Such projects are usually smaller than PL 566 projects and attempt to solve more localized problems.

Table 15 summarizes the name, responsible agency and location of these projects and is presented to describe the number and type of water related project activities occurring in the region.

TABLE 15
WATER RESOURCE MANAGEMENT PROJECTS

| | PROJECT NAME | COUNTY | STATUS |
|---|---|---|---|
| SCS PL 566 | California Lake | Dixie | Plan approved for construction |
| | San Pedro Bay | Taylor | Active approved application |
| | Cherry Lake | Madison | Active approved application |
| | Big Alligator Lake - Rose Creek | Columbia | Inactive |
| | Water Oak Creek | Bradford | Project not active |

Source: NE Gulf River Basin Study

| | | | |
|---|---|---|---|
| SCS RC & D | Mayo - Calf Creek | Lafayette | Ongoing |
| | Pickett Lake | Lafayette | Ongoing |
| | Live Oak | Suwannee | Ongoing |
| | Greenville Water Mgt. Proj. | Madison | Ongoing |
| | Desoto Lake | Columbia | Ongoing |

Source: NE Gulf River Basin Study

| | | | |
|---|---|---|---|
| Corps of Eng. | Gulf Intercoastal Waterway - St. Marks to Tampa Bay | Dixie & Taylor | Active |
| | Suwannee R. Navigation Proj. Suwannee Sound to Ellaville | | 25% completed |
| | Suwannee R. Nav. Study | Dixie & Levy | Active |
| | Steinhatchee River Channel Maintenance | Taylor | Continuous |
| | Hogtown Creek (Clear Lake) Levee Project | Alachua | Inactive |

Source: 303(e) Basin Plans

# ROCK & MINERAL RESOURCES

## INTRODUCTION

The rock and mineral resources of Florida are singular in the respect that they are essentially non-renewable resources. That is, reserves of these non-metallic materials, commonly found in the State such as: phosphates, oil and gas do not normally accumulate in nature over short intervals of time. Natural recovery of deposits must take place through geologic time and are not to be measured within a meaningful time frame such as human life spans.

Because of the tremendous demands placed upon our mineral resources by our complex agricultural and industrial industry, many of our proven mineral reserves can last no longer than a few decades. It is painfully obvious that once high grade deposits are depleted, ever increasing amounts of time and energy will be required to obtain and refine lower grade reserves. The high quality phosphate resources of Florida are an excellent example of this.

Impetus must be applied to the conservation of resources because of their non-renewable nature emphasizing the need to prevent waste, useless dissipation and needless loss of natural materials especially where known reserves are rapidly diminishing. It is recognized that future needs will have to be met through utilization and recovery of "waste" materials, and replacement by alternate resources where available and both combined with continual research into resource utilization.

Along with these considerations, an environmental awareness of the effects of extractions of such resources from the earth demands attention. Proper restoration of worked out areas is important to proper land utilization, resource planning and environmental quality.

Therefore, inasmuch as our economy depends on a balanced input from all resources, it is apparent that potential limitations imposed by deteriorating reserves of high quality, non-renewable resources are a key consideration in planning for the future. Understanding this central role with respect to the location and values of such resources existing in the region is an important element in the comprehensive planning program.

Certain rock and mineral deposits in north central Florida are noteworthy and significant as natural resources. The objective of this section is to

describe their occurrence, potential for economic utilization and some related development considerations. The deposits to be considered include: limestone and dolomite, phosphate, clay, sand, gypsum, oil and natural gas.

## CLAY DEPOSITS

Clay is one of the common products of the decomposition of rocks. It is usually made up of a number of different minerals in varying proportions and is often defined as a very fine grain, earthy material which becomes plastic (workable) when wet. More specifically, clays are hydrous aluminum silicates mixed with varying proportions of impurities. These silicates occur in many mineral forms each of which has distinctive properties that give rise to the suitability of the different clays to particular industrial uses.

The State of Florida has been an active clay producer for many years. Until 1923, Florida produced more Fuller's earth type clay than any other state. By 1922, as many as twenty-three different companies were operating in Florida. Since that time, the number of working clay operations has decreased and in 1965, there were only two operating brick plants. However, rapid increases in the population of Florida in the past decade has stimulated the building industry tremendously creating a market for additional materials. At the present time, there are eight companies in the State producing clay for a variety of products. None of these, however, are located in this eleven county region.

Primary clay varieties include: kaolin or China clay, fire clay, bentonite, Fuller's earth and miscellaneous or common clay. The majority of all clay that is produced is utilized in the manufacture of ceramic products. Ball clays and fire clays are used by the ceramic industry. Bentonite and Fuller's earth are used in processing petroleum products, foundry facings, drilling muds, insecticide bases and other non-ceramic purposes. The miscellaneous clays include those materials generally referred to as common clays and are used to manufacture heavy clay products such as brick, tile and portland cement.

There are three basic types of clay which are or have been important to Florida, Fuller's earth, kaolin and the common clays. Fuller's earth is a type of clay with little plasticity. Its properties as a natural active beaching agent were utilized during the middle ages for removing grease and fat from woolen cloth, and later aided in refining mineral and vegetable oils. Presently, it is used to de-ink newsprint and as an additive to concrete, soaps, insecticides, cosmetics, adhesives, ceramic glazes and many other products. Fuller's earth is an inexact term applied to clays that are by nature highly absorptive. Montmorillonite is the dominant clay mineral constituent.

In recent years, all the Florida production has come from mines located in Gadsden County, but Fuller's earth was formerly mined in Marion and Manatee counties with isolated but not economically valuable deposits also reported from Alachua County.

Kaolin is another clay product important to Florida. Kaolin is a high grade clay often called China clay. It has many uses in addition to the manufacturing of China clay. Its largest use is a filler in paper, but it is also used in the rubber industry and in the manufacture of refractories.

Kaolin, or China clay, is admixture of clays that has the mineral kaolinite as an important part of its composition. Commercial deposits have been mined in Putnam and Lake County where large deposits reportedly occur. In addition, Kaolin has been found in Suwannee, Lafayette and Alachua Counties, although not in commercial quantities.

Perhaps of more importance of Florida are the clays utilized for common brick manufacture. These clays are usually of an inpure, often sandy composition, they have a medium degree of plasticity and varying strength, color and other properties. These clays are widely distributed in Florida and appear to be the most common variety found in the region.

These common, or structural clays, are utilized in building bricks, sewer pipes, roofing tile, lightweight aggregate, and portland cement. Although mined in the past and utilized in the manufacture of common brick, the use of such clays had declined due to the sandy nature of clay deposits which along with other impurities hindered their usefulness and economic value. Common clays in particular have been found to occur throughout most of the region associated with natural accumulations in the Hawthorne Formation as well as with residual clay deposits attributed to the decomposition of underlying limestones of the Ocala Group.

In general, although Florida's Fullers' earth production was second in the nation in 1972, none of this material was produced in north central Florida. However, because of the extent of the various clay deposits in the region, there may be future potential for clay production contingent upon further exploration and refinement of methods to wash inpurities from clays as they are removed from the earth.

## LIMESTONE AND DOLOMITE

Limestone (calcium carbonate), including also in a broad sense dolomite (magnesium calcium carbonate), are the most widely used of all rock mined in Florida. Almost the entire production of rock or stone in Florida is some variety of limestone.

Blocks or slabs cut from natural stone suitable for utilization in buildings or for construction are called dimensional stone. Difficulties associated with the variable composition of limestone, production methods and competition with newer construction materials such as architectural concrete, glass and aluminum have almost eliminated production of such materials in Florida.

By far the greatest use of these resources is in the form of crushed or broken stone. The use to which such products are put include: concrete, road metal, riprap, railroad ballast, agricultural limestone (including dolomite), portland cement, lime, fuel oil additives and other miscellaneous uses. The major limiting factor to limestone mining, in addition to composition and depth to the rock body, is the availability of inexpensive transportation. Therefore, the product is usually mined near adequate roads or railway transportation in order to be economically competitive.

In this region of north central Florida, the Ocala Group of limestones, in particular, the Crystal River and Williston Formations as well as the Suwannee Limestone, lend themselves to mining largely because of their location at or near land surface over large areas of the region. In general, the limestones of the Ocala Group that are quarried in the region and around the central and northern portion of the State have a uniform texture that allow ready crushing and pulverizing. They are generally free from grit and in some areas the rock approaches the purity of 100% calcium carbonate. Dolomites and dolomitic limestone portions of the formations in the Ocala Group as well as the Suwannee Limestone occur near the surface in Taylor and Dixie Counties. The hardness of crushed dolomite makes it especially desirable for roadstone and other uses where such hardness is desirable. In addition, its chemical composition makes it especially useful for agricultural purposes.

According to Information Circular Number 88 (1972) of the Florida Bureau of Geology, this region has three counties which produce crushed limestone: Alachua, Suwannee and Taylor. In that year, production was reported from seventy-five mines in sixteen Florida counties. At that time, Alachua County reported four quarries supplying crushed limestone and dolomite. Production in 1971 totaled 2,035,040 short tons for a value of $1,596,000 and in 1972, production totaled 2,166,000 short tons for a value of $1,741,000. This represents only about 4.3% of the State's total production by volume in 1972. Similar information for Suwannee and Taylor Counties was withheld from publication to avoid disclosing individual company confidential data.

A better perspective of the potential for limestone production in this eleven county region can be obtained from Information Circular Number 66 (1968) of the Florida Bureau of Geology. This publication reports seventeen active quarries in five counties of the region: Alachua (7), Suwannee (4), Taylor (3), Lafayette (2), and Columbia (1). Unfortunately, statistics on production were not included in that publication. From the map of General Geology, it may be observed that other counties in this

region notably Dixie, Madison and Gilchrist also have the potential for limestone production based upon an abundance of near surface exposures. Therefore, because of the large volume of naturally available limestone, the region will probably continue to produce crushed limestone and dolomite for many years.

As with abandoned phosphate mines, limestone quarries are not easily reclaimed and become both a nuisance and liability to owners. Reclamation is often possible to a limited extent by such measures as filling with non-putrescible waste, such as construction debris, or conversion of sites into managed recreational areas. Viewed as resources or liabilities, they represent a land use which requires attention during the land use planning process.

## PHOSPHATE RESOURCES

The principal use of phosphate rock is in the production of superphosphate for use as a fertilizer. In nature, phosphorus is taken up by vegetation and returned to the soil upon a plants subsequent death and decay. The quality of the soil is thereby maintained. During crop cultivation, phosphorus is removed with each harvest and, if the productivity of the soil is to be maintained, the phosphorus must be replaced in the form of super-phosphate or alternate soil supplement containing other soluble phosphate. In fertilizers, such as superphosphate, which is made by treating phosphate rock with sulphuric acid, the phosphorus is available to plants in a much more soluble form than in untreated phosphate rock which was frequently utilized in earlier soil benefaction efforts. Therefore, the value to modern agriculture of this artificial enrichment cannot be underestimated.

Phosphate deposits of northern Florida consists primarily of marine phosphatic sedimentary rocks made up of clays, sand, dolomite and a variety of alterations of this material formed by weathering processes. Phosphate rock is neither constant in composition nor occurrence and consists of a variable mixture of calcium phosphates and other minerals. The phosphate-bearing rocks and minerals of Florida have been classified into four very general categories: land pebble, river pebble, hard rock and soft rock. Of these, only the land pebble, or grandular phosphate is being mined in Florida. River pebble, or stream placer deposits, are relatively unimportant in this area. The "soft rock" deposits (clayey sands with phosphate particles) are normally associated with hard rock deposits and are not differentiated in this discussion. Due to differences in occurrences, the two categories, hard rock phosphates and pebble phosphates, are considered individually.

## Hard Rock Phosphate Deposits

Hard rock phosphate was apparently first mined in Florida and utilized on a local scale in Hawthorne in 1883, after it was discovered that sandstone being quarried there contained considerable amounts of phosphate. In 1888, phosphate was discovered in what is now part of the hard rock phosphate district near Dunnellon in Marion County. Following the discovery of these extensive hard rock phosphate deposits in Marion County, commercial mining developed rapidly until 1907, when the production of hard rock phosphate in north central Florida reached a peak. At that time, there were forty-five companies producing hard rock phosphate in central and northern Florida including twenty-two in Alachua County, three in Columbia County and one in Suwannee. After a brief revival following World War I, production declined until 1977, when all hard rock phosphate production in Florida ceased.

The hard rock phosphate deposits of Florida are roughly confined to a north to south trending linear belt along the west of the peninsula. This concentration is largely controlled by the Ocala Uplift. The Ocala Uplift is an elongated anticlinal fold or arch stretching some two hundred miles long and seventy miles wide. The axis lies a few miles west of Alachua County. The hard rock phosphate concentration occurs primarily on the central portion of this Uplift in an area one hundred miles long and thirty miles wide covering the total area of some 15,000 square miles. These hard rock deposits are found in fifteen counties including Alachua, Columbia, Gilchrist, Levy and Suwannee in this region.

The deposits are highly irregular in shape and size and range from several feet to over one hundred feet in thickness. In the Newberry area of western Alachua County, where it was once mined, the maximum thickness is about fifty feet and the average less than thirty feet. It is reported that gray, phosphatic, sandy clay, as much as eighty feet thick, covers most hard rock deposits.

The geology of the hard rock deposits is very complex. These deposits have been described as irregular mixtures of quartz, sand, chert, clay minerals and carbonate flourapatite, principally in the form of collophane ($Ca_5F(PO_4)_3$), an amphorous phosphate-rich mineral. In general, these deposits correspond in areal extent with outcropping of the Alachua Formation. Similarly, a degree of coincidence with the physiographic feature known as the Brooksville Ridge is also apparent from topographic studies. The Rock and Mineral Resource map illustrates the approximate extent of hard rock deposits in the subsurface of the region.

In the 1890's and early 1900's, hard rock phosphate production flourished because, with naturally occurring high phosphate percentages, it was ideal for export as washed and screened rock. As benefaction techniques were improved for the large deposits of land pebble phosphate, hard rock

production declined. Neither the production of hard rock nor soft rock phosphates since 1942, has contributed a significant amount to the phosphate industry. Under changed economic conditions, the hard rock phosphate reserves of the state may again be mined. Renewed activity in hard rock deposits depends upon several factors which includes:

1) Depletion of present premium grades (74% BPL* and above) and quantities of land pebble deposits.
2) Reduced transportation costs.
3) Minimum competition from other sources of phosphates.

## Land Pebble Phosphate Deposits

Most of the phosphate produced in Florida comes from the Bone Valley Field in Polk and Hillsborough Counties. These rich phosporite (phosphatic, clayey sand) beds of south Florida are termed "land pebble" phosphate deposits. This term has also been applied to deposits in the rich phosphate beds of the Hawthorne Formation in northern Florida.

In north central Florida, pebbles and grains of phosphate minerals occur throughout the sediments of the Hawthorne Formation and also occur as concentrations in lenses or other irregular bodies. Pirkle (1967) reported on important occurrences of pebble phosphate in the upper part of Hawthorne Formation near Gainesville in Alachua County. This zone of phosphatic materials varies in thickness from a few feet to 30 or 40 feet and consists largely of pebbles and grains of phosphate embedded with varying combinations of sand, clay, and carbonate materials. Reserves between 30 and 50 million tons are cited for Alachua County with a grade exceeding 50% BPL in recoverable phosphorous.

Other existing or potentially valuable deposits in the region recognized by Mansfield (1942) include an area of about 16,000 acres in Bradford County between Brooker and Hampton and along Olustee Creek in Columbia and Union Counties. In addition, Hamilton County is reported to have an extensive area (about 62,000 acres) of pebble bearing phosphate extending from the Withlacoochee to Alapaha Rivers. Available literature suggests that the quality of these reserves varies from about 55 to 70% BPL and are generally amendable to benefaction techniques.

Additional areas have attracted particular interest as evidenced by actual mining activities. Information Circular Number 6 of the Florida Bureau of Geology (1978) reports two phosphate mining operations in the region. The Loncala Phosphate Company operated one mine in Gilchrist County in 1968. However, Information Circular Number 88 (1972) does

*1.0 percent BPL (Bone Phosphate of Lime or tricalcium phosphate) equals 0.458 percent $P_2O_5$, or BPL equals $P_2O_5$ times 2.185.

not record production by this mine. Both references, however, recognize the continual operation of the Occidental Chemical Corporation mine near White Springs in Hamilton County. No production figures are available for either area.

In addition to these activities, information is available which suggests continued interest by mining companies in areas having phosphate reserves in Alachua, Bradford and Union Counties and, perhaps move significantly, in and around the Osceola National Forest of Columbia County where mining leases are held by various companies. Such continued interest is indeed warranted. It must be recognized that phosphate producers must eventually mine lower grade materials because it is a nonrenewable resource, and although there is a great quantity of low grade phosphate in the Bone Valley District, there is also a tremendous potential for the development of additional phosphate deposits in areas of north central Florida.

In summary, the pebble phosphate deposits which occur near the top of the Hawthorne Formation in the plateau area of north central Florida do contain significant amounts of low grade phosphate reserves. Therefore, the potential for economic development of phosphate reserves in the future, particularly in light of rising population and increased demand or food production, is a reality which must be considered in regional plans and programs.

## GYPSUM

Although the United States has huge reserves of gypsum, the mineral is only known for minor occurrences in Florida. In general, gypsum (a hydrous calcium sulfate) is a common mineral thought to have been formed by the evaporation of sea water. Many gypsum beds were originally deposited as anhydrite (anhydrous calcium sulfate) which was changed to gypsum in alteration processes associated with weathering. Occurrences of gypsum in Florida are associated with areas having sulfur waters which have encountered shell or limestone fragments. Several gypsum localities are known in the state but none has enough reported reserves to be economically extracted. No natural accumulations are reported in this region of north central Florida and most of the raw gypsum consumed in Florida is imported.

Of minor importance, but worthy of note is the calcium sulphate waste product obtained from the preparation of superphosphate fertilizer. This "gypsum" could be recovered. However, from a commercial point of view, the quantity of such material is small. The possibility of a by-product use with this gypsum product presents an interesting problem in industrial chemistry because of its potential conversion into ammonium

sulfate fertilizer, or other industrial chemicals. Perhaps even more importantly it may be utilized as a soil additive in areas of depleted soil quality or inferior character.

## SAND

As evidenced by the preceding section on geology, sand is one of the most abundant surface materials in the region, with the thickest sequences occurring in the northern and eastern portions of the region. Here, sand deposits may be found to exceed 100 feet in some localities.

Sand is an unconsolidated granular material composed of a mixture of many minerals. However, with the exception of the shell and carbonate content of the coastal sands, the dominant mineral in the sand deposit is quartz (silicon dioxide). The quartz sands of Florida have had a complicated history. All have been transported to the state and are found in fluvial, deltaic, marine and aeolian deposits. The Pleistocene terrace deposits are a prime example of marine shoreline accumulation. Examples of all forms of accumulation may be found in the region.

Although many sites in the region have been mined in the past and new sites utilized as demand requires, the sand remains a common variety useful as building material and to suit other general purpose requirements. It has not been found to have a high degree of purity or constant composition such as those suitable for glass manufacture or for similar special products requiring a high grade material. Such a sand product suitable for glass production is generated as a by-product of clay mining in nearby Putnam County, however.

Sand deposits in the region, although abundant, are useful only for general purposes but apparently not significant in terms of economic potential. Adequate supplies may be found in most counties of the region to meet local construction needs. In part, owing to its abundance, sand remains a low value material which cannot tolerate high cost transportation over long distances to be economically competitive.

## OIL AND GAS RESOURCES

It appears that there has always been an interest in the possibility of producing oil and gas in Florida. Since the establishment of the Florida Geological Survey in 1907, attempts have been made to record details of all exploratory drilling and to gather historical data on previous

exploration wherever possible. In June, 1945, the Florida Legislature enacted a law regulating the drilling of oil and gas. This law required that information collected be kept on file with the Florida Geological Survey. This promoted more accurate data aquisition as well as the creation of a filing system to be used for future reference and utilization in exploration surveys.

Wells drilled prior to 1939 were based largely on general geologic evidence or hunches, such as topographic and physiographic resemblance to oil fields located in other areas. From 1940 to the present, the exploration of oil and gas has been rather extensively conducted by the major oil companies. Although wells have been drilled all over Florida, including a number in Alachua County, no more than traces of oil were found in this region.

During 1972, nine oil fields were producing in Florida six of which are located in the Sunnyland Limestone of Collier, Hendry and Lee Counties. The other three are located in Santa Rosa County. At the present time, although explorations are continually being carred in the state, there appears to be little evidence to suggest that oil or gas reserves will be found beneath north central Florida except perhaps on the continental shelf in the Gulf of Mexico where explorations have not yet proven fruitful.

## GENERAL CONSIDERATIONS

Within the region, there most likely are mineral deposits which have not yet been found and others, such as phosphate resources, that are not commercially mineable at this time. Continual advances in prospecting and benefaction techniques along with the changes demands for rock and mineral resources will undoubtly enhance the extraction potential of many deposits in the region in future years. Essential elements of land use planning must, therefore, consider in realistic terms, resource management concepts such as conservation and preservation, renewable and non-renewable resources, and environmental impacts, balancing all issues with human requirements.

With respect to resource management, of particular concern are impacts on land resources from extractive operations. Mined areas are usually highly erosive and unless remedial actions are employed, will not recover naturally for many years if at all. Limestone quarries, sand and phosphate strip mines and other historical evidences of open pit mining which have not yet been reclaimed exist within the region.

Information has been presented in the USDA Cooperative Survey of the Northeast Gulf River Basins in Florida, Alabama, and Georgia relative

to surface mining activities in Florida. Drawing from that publication, information for Florida counties includes an estimate of total acres needing reclamation, acres in which there is a legal obligation for reclamation and "orphan" acres, i.e., land which no one has an obligation to reclaim. The figures presented in Table 16 are noted as being current only through January, 1974, because as mining and reclamation operations continue, it is not possible to remain current.

It is evident that reclamation of disturbed areas will continue to be a problem in the general absence of mining regulations within the region. Of all the counties in the region, only Alachua at the time of writing, possess an ordinance which gives local government some measure of control over land resources with their jurisdiction. Bradford County has considered but rejected such a proposition, while Columbia County is developing mining regulations at the present time. The need will become more acute in future years. The development and implementation of effective mining and reclamation ordinances region-wide is encouraged.

A map has been included illustrating the arial distribution of potentially recoverable rock and mineral resources in the region. The general ranking or value of each resource is subjective in nature and based upon an evaluation of current mining efforts, estimates of available reserves and economic potential as well as a consideration of potential future utilization. The ranking as represented was developed with the assistance of Mr. Michael Knapp, Geologist, with the Florida Bureau of Geology. Mapping was accomplished utilizing unpublished surface lithology maps prepared by that agency for the thirty minute sectional maps entitled, "Valdosta, Georgia and Gainesville, Florida." The sequence of relative values to the region is as follows:

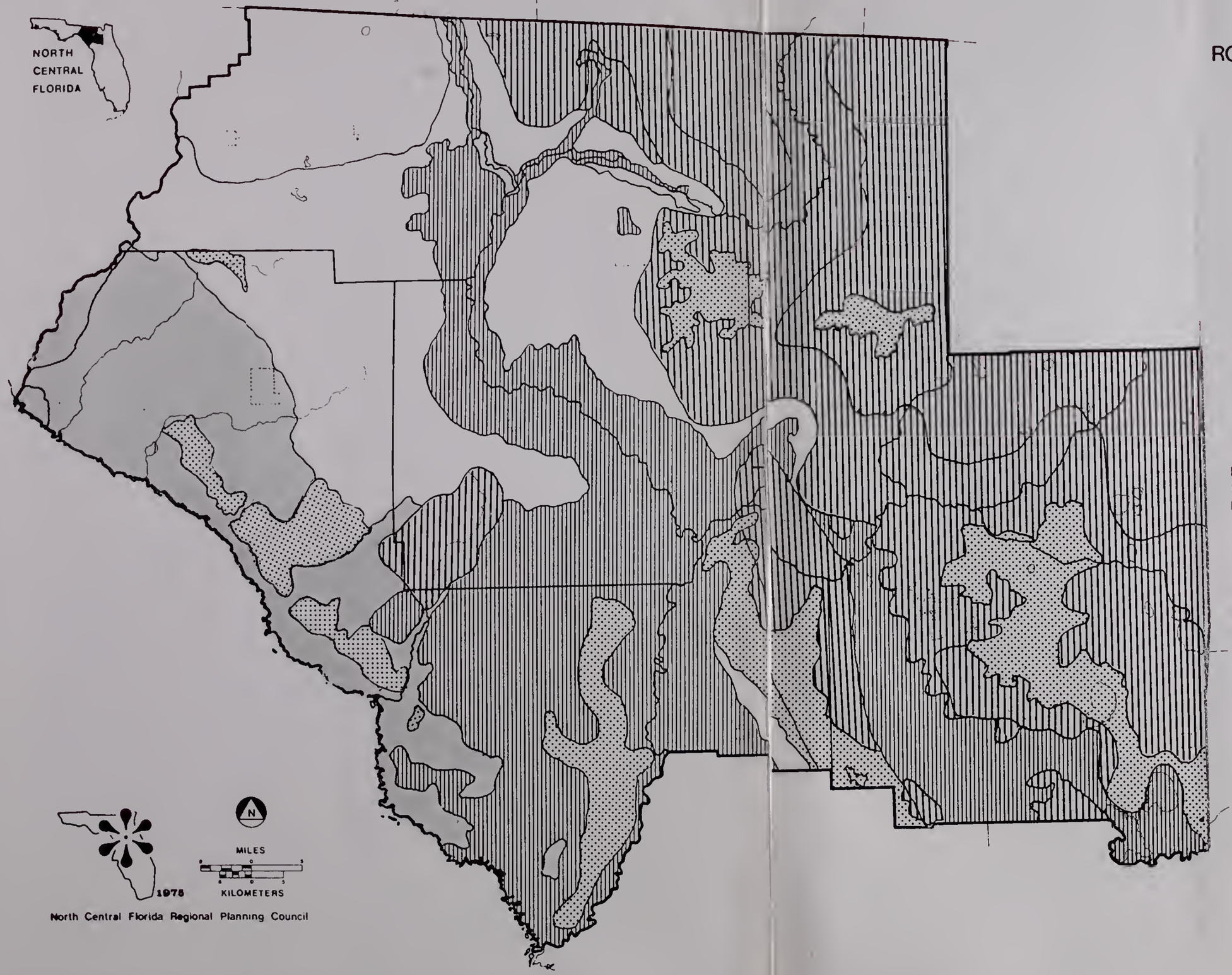
| | |
|---|---|
| Phosphate | Greatest relative value |
| Limestone | |
| Dolomite (limestone) | |
| Sand | Least relative value |

TABLE 16
LAND TREATMENT NEEDS ON STRIP MINED AREAS IN NORTH CENTRAL FLORIDA

| COUNTY | MINED ACRES | RECLAIMED ACRES | TO BE RECLAIMED ACCORDING TO LAW | "ORPHAN" ACRES | TOTAL NEEDING TREATMENT |
|---|---|---|---|---|---|
| Alachua | 9200 | 0 | 0 | 9200 | 9200 |
| Bradford | 340 | 340 | 0 | 0 | 0 |
| Columbia | 525 | 201 | 0 | 324 | 324 |
| Dixie | 75 | 0 | 0 | 75 | 75 |
| Gilchrist | 30 | 0 | 0 | 30 | 30 |
| Hamilton | 340 | 0 | 340 | 0 | 340 |
| Lafayette | 11 | 0 | 0 | 11 | 11 |
| Madison | 400 | 80 | 0 | 320 | 320 |
| Suwannee | 1850 | 0 | 0 | 1850 | 1850 |
| Taylor | 14 | 0 | 0 | 14 | 14 |
| Union | 0 | 0 | 0 | 0 | 0 |
| TOTALS | 12770 | 621 | 340 | 11824 | 12164 |

Source: Volume 1, Northeast Gulf River Basin Study for Florida, Alabama, and Georgia. USDA Cooperative Survey, November, 1976.

# ROCK and MINERAL RESOURCES




Increasing
Economic
Potential

NO KNOWN
ECONOMIC RESOURCES

SAND

LIMESTONE / DOLOMITE

LIMESTONE

PHOSPHATE

# SOILS

## INTRODUCTION

Soils are demonstrably important in all formal and informal planning activities because almost every work of man is necessarily limited to them as a basic starting point. They constitute one of our most valuable resources and by their function are basic to all life processes. As such, soil provides the medium for growing food and fiber and also provides the foundation for homes, stores, factories, schools, airports, roads, playgrounds and other land uses.

Soils may be defined as distinct three dimensional bodies of material lying at the earth's surface limited by the atmosphere above, bedrock or transitional rock material below and other soil bodies laterally. They have formed as a result of interacting physical, chemical and biological processes and have been conditioned by climate over a period of time to form a mixture of weathered rock material and minerals, organic matter, water and air in varying proportions.

Many characteristics or properties of soils may be shown to have a direct influence on the types of feasibility of urban development. These characteristics include permeability, infiltration, wetness, depth to water table, depth to bedrock, texture and slope. Detailed descriptions including physical and chemical properties as well as limitations and capabilities are developed and reported for each kind of soil delineated on soil maps. Such maps provide a strong basis for developing land use alternatives by local governments and private developers.

## SOILS AND PLANNING

Early investigations into soil types were promoted by the growth of our agriculturally oriented society coupled with the needs of an expanding nation into a new continent. Further impetus for use of soils information was brought about during World War II when engineering interpretations of soil capabilities were necessary to adequately plan for military construction and operation. Since the early 1950's, detailed soil surveys coupled with in-depth soil analysis and interpretation have shown that

soils information is valuable for both general and operational planning, particularly if soil suitability interpretations have been prepared by soil scientists.

Soil survey information and interpretations are as important for urban use as they are for agricultural use. Adequate soil information greatly assists in developing and understanding the capabilities and limitations of sites for variety of land use activities. Experience gained from selecting soils for farming, ranching, and forestry may be applied equally well to selecting and evaluating sites for housing, highways, and a variety of other uses. The publication entitled "Ten Year Master Plan for Accelerating the Soil Survey of Florida" (1972) states that the minimum cost benefit ratio afforded by soil surveys to be on the order of 1:48 in low intensity areas. Cost benefit ratios expand to 1:123 in areas with high intensity land uses.

Specifically, a soil survey is an acre by acre inventory of soil resources. It is developed through onsite investigations by a soil scientist who classifies soils encountered according to a national system of soil taxonomy. Following the location of soil types on aerial photographs, each soil is interpreted as to its potential or limitations when subjected to various uses in management. Combined with maps and explanatory texts soil surveys are normally published on a county basis. As such, these surveys form the basis for all resource conservation planning assistance provided bu USDA Soil Conservation Service soil scientists to citizens and local governments.

In Florida, the Soil Conservation Service and the Florida Agricultural Experiment Stations have joint authority and responsibility for conducting soil surveys. Although PL 46 enacted by the Congress gives federal responsibility to the Soil Conservation Service for all soil survey activities of the U.S. Department of Agriculture, Florida Law 604 (1941) provides for a state-wide soil survey which shares responsibility for soil surveys with the Agricultural Experiment Station of the University of Florida. Both agencies therefore cooperate in the soil survey program for Florida. The Soil Conservation Service is responsible for all field mapping and publications, while the Agricultural Experiment Station contributes laboratory analysis of soils and assists in soils interpretations.

The USDA Soil Conservation Service is presently conducting an accelerated soil survey program in Florida. This effort began in 1973, and its goal is to have modern soil surveys completed for each county in the state by 1983. In comparison, at mapping rates occuring prior to this program, the completion of a state survey was not anticipated to occur until the year 2015.

Unfortunately, the ten year accelerated program lags at least two years behind schedule due to inadequate funding. At the present time, the Soil Conservation Service, representing the federal government in the Cooperative Soil Survey Program, budgets approximately $372,000 annually

for soil surveys in Florida. The Florida Agricultural Experiment Stations add an additional amount of about $57,000 per year. The Florida legislature is participating in the program also although the degree of assistance provided has generally been less than optimum because of the necessity for reduced appropriations. Only one year in the past three has been fully funded. In order to expedite the soil survey in individual counties, local governments are also requested to provide nominal financial assistance to soil conservation service efforts in this program.

In summary, forty-six percent of the funds allocated have been appropriated since the accelerated soil survey program was initiated. Approximately seventy-one percent of the mapping goal has been achieved to date, modifying the estimated time of completion to 1990.

Table 17 summarizes the status of soil surveys in north central Florida. Of the eleven counties in the region, it is of note that only Suwannee County has a complete modern soil survey. Progress on such a survey has slowed considerably in Alachua County after only about twenty percent of the county has been mapped due to variations in County funding. Progress in all counties of the region will remain minimal at least for the present with mapping only occuring as necessary for immediate site assistance. Inasmuch as no other county in the region has indicated a desire to participate in the Accelerated Soil Program, it is unlikely that the Soil Conservation Service will recognize a priority need in this region to the exclusion of other counties in this state which have indicated a willingness to financially assist in the preparation of surveys.

TABLE 17
STATUS OF SOIL SURVEYS IN NORTH CENTRAL FLORIDA

| COUNTY | TOTAL ACRES IN COUNTY | ACRES MAPPED |
|---|---|---|
| Alachua | 570,880 | 184,600 |
| Bradford | 187,520 | 0 |
| Columbia | 503,040 | 112,000 |
| Dixie | 440,320 | 565 |
| Gilchrist | 216,960 | 0 |
| Hamilton | 328,960 | 0 |
| Lafayette | 347,520 | 0 |
| Madison | 449,280 | 0 |
| Suwannee | 443,280 | 0 |
| Taylor | 660,480 | 9,730 |
| Union | 153,600 | 0 |

Source: Updated from the Ten Year Master Plan for Accelerating the Soil Survey of Florida.

# SOIL MAPS

Soil maps at various scales and degrees of generalization may be developed and utilized along with interpretations to provide basic planning data for rural as well as urbanizing areas. The scale and detail of soil maps or the level of generalization of soils data required, are determined by the intensity of planning desired. Detailed soil maps are designated to meet the needs of operational planning and offer the highest amount of precision and predictability. In comparison, general soils maps are designed for general or broad planning purposes. Both general and detailed soil maps may be interpreted or explained by using tables, narratives, and interpretive maps which illustrate ratings as to soil suitabilities, limitations or potential for various uses, such as those utilized herein.

Detailed soil maps are provided to meet the needs for operational planning. The scale of detailed maps is normally 1:20,000 (3.17 inches = 1 mile) or 1:15,840 (4 inches = 1 mile). The smallest size of significant soil separation is about two to three acres. Examples of such soils may be found in the modern soil surveys completed for Suwannee County and those preliminary soil survey maps prepared in Columbia and Alachua Counties.

General soil maps are made by summarizing information from detailed soil maps, by reconnaisance, and/or by utilizing information on relief, geology, vegetation, climate, land use and other indicators of soil types. Such maps are very useful as a tool in broad scale planning by providing information on an area's general suitability for various land uses. General soil maps, with the smallest soil delineation of only about 40 acres are not suitable for detailed planning purposes. Therefore, the broad soils generalizations mapped herein must be recognized as intended to show only general soils conditions. The General Soils Atlas for Regional Planning Districts III and IV is the only complete compilation of general soils maps for all counties in this region. Therefore, it forms the basis for the regional soils analysis performed for this study.

Each delineation on the general soil maps represent a group of soils that occur together in nature to form a distinct "soil association." Each association consists of one or more major soils and at least one minor soil. Associations are named for the major soil constituent. Table 18 which follows, lists the soil associations that occur within the region grouped according to the relative degree of limitations for community development.

For each soil association defined in the Soils Atlas, an evaluation is provided which defines the associations relative degree of limitations based upon certain defined uses. Applying only to soils in their natural state, the degree and kind of limitation is defined for sanitary facilities.

TABLE 18
SOIL ASSOCIATIONS IN NORTH CENTRAL FLORIDA

| DEGREE OF LIMITATION | SOIL ASSOCIATION | COUNTIES* FOUND |
|---|---|---|
| Slight | Orangeburg-Lucy-Dotham | M,T |
| | Blanton (High)-Lakeland | S |
| | Chandler-Apopka | A,G |
| | Arredondo-Alaga-Kenney | C,H,M,U |
| | Alpin-Blanton | B,C,D,G |
| Slight to Moderate | Alpin-Blanton-Eustis | H,L,M,T |
| | Kendrick-Hague-Zuber | A |
| | Faceville-Carnegie-Orangeburg | M |
| | Arredondo-Kanapaha | S |
| | Blanton-Chiefland | S |
| | Dotham-Orangeburg-Red Bay | M |
| | Jonesville-Chiefland-Archer | A,G |
| Moderate | Blanton-Kanapaha | L |
| | Arredondo-Zuber | A |
| | Archer-Chiefland | C |
| | Hernando-Archer-Chiefland | A,G |
| | Chipley-Chiefland | C |
| | Ardilla-Leefield-Stilson | M |
| | Adams-Chiefland-Blanton | D |
| | Susquehanna-Bowie | S |
| | Stilson-Pelham-Mascotte | A,B,U |
| | Sparr-Lochloosa-Tavares | A |
| | Blanton (Low) | S |
| | Blanton-Susquehanna-Bowie | S |
| Moderate to Severe | Fellowship-Hague-Blichton | U |
| | Tavares-Myakka-Basinger | A |
| | Kanapaha-Chipley-Scranton | N |
| | Chipley-Blanton-Swamp | D,G,H,L,M |
| Moderate to Severe (Cont.) | Chipley-Albany-Rutledge | C,U |
| | Chipley-Albany-Plummer | L,H,T,M |
| | Broward-Matman-Osier | D,T |
| | Chipley-Leon-Plummer | D |
| | Leefield-Mascotte-Albany | C |
| | Chipley-Leon-Osier | B |
| | Blichton-Flemington-Kanapaha | A |
| Severe | Leon-Plummer | S |
| | Scranton-Bassinger-Myakka | A |
| | Lynne-Pomona-Pompano | A |
| | Eureka-Paisley-Eaton | A |
| | Manatee-Felda | L |
| | Manatee-Felda-Copeland | D,T |
| | Portsmouth-Rains | U |
| | Blanton-Kalmia-Swamp | S |
| | Pelham-Plummer-Rutledge | B,U |
| | Surrecy-Portsmouth | C,H |
| | Osier-Rutledge-Leon | N |
| | Martel-Placid | A |
| | Myakka-Wauchula-Placid | A |
| | Leon-Mascotte-Surrency | G,U,B,C,S |
| | Leon-Mascotte-Rutledge | D,H,L,M,T |
| | Meggett-Wauchula-Chobee | A |
| Very Severe | Plummer-Rutledge | A,D,L |
| | Salt Marsh-Coastal Dunes | D,T |
| | Brighton | B,C,U |
| | Brighton-Dorovan | H,M |
| | Okechobee-Terra Ceia | A |
| | Fresh Water Swamp | A,B,C,D,G,H, L,M,T,U |
| | Alluvial Land-Swamp | S |
| | Swamp-Shallow Limestone | T |

*Counties identified by first letter in county name

Limitations given relative to suitability for community development.

Source: General Soils Atlas for Planning Districts 3 and 4.

community development and water management among other potential uses. Soil limitations are indicated by the ratings: slight, moderate and severe. These are not suitability ratings but more precisely are measured of degree or intensity of soil limitations or hazards. As such, they do not represent strict restrictions on soil use as most soils are suitable for all uses if provisions can be made to overcome the problems presented. Provided adequate funding is available, modern engineering techniques may be utilized to overcome almost any soil limitation.

A map prepared for this text entitled General Soil Suitability for Community Development summarizes the interpretations found in the General Soils Atlas for community development. The components of community development identified for analysis include an evaluation of soil suitability for shallow excavations, dwellings, light industry and local roads and streets. In addition, due to the predominantly rural nature of the region and the dependence of septic systems for waste disposal, the soil limitations for septic tank absorption fields was also included as part of the analysis. In this regional assessment, each of the fifty-nine soil associations in the region was assigned a numerical value based upon the average limitations assigned to community development and soil suitability for septic tank absorption fields. Utilizing the assistance of the Alachua County Soil Conservation Service office, relative numerical values representing each soil association were calculated and utilized to identify six separate but distinct groups of associations in which each group was broadly categorized by degree of suitability for community development. It was therefore possible to define on a regional scale broad groups of soils which would tend to enhance or limit development.

NORTH CENTRAL FLORIDA

# SOIL POTENTIAL FOR COMMUNITY DEVELOPMENT

Decreasing Potential

N

MILES

KILOMETERS

1978

North Central Florida Regional Planning Council

# VEGETATION

## INTRODUCTION

In this chapter, two broad categories of terrestrial vegetation, forests and agriculture are considered. Both plant associations are vital to the maintenance of human systems. Vegetative growth provides a basic mechanism for the transfer of solar energy and the recycling of nutrients into usable forms. The raw materials for food, fuel, the construction of shelter, wildlife habitat and other environmental amenities produced in these biological communities reflect their values as renewable natural resources.

## AGRICULTURE

### General

Florida possesses highly favorable conditions for agricultural pursuits. It has an abundance of land and water; and while many of our soils are not naturally fertile, they do respond well to fertilization and proper management. Compared to many parts of the world, Florida's water supply, rainfall, long growing season and warm winters are superlative and encourage intensive agriculture and animal husbandry.

Although agriculture has historically been one of the most stable and important segments of Florida's economy, it remains sensitive to the problems and uncertainities of our modern society. The realities of managing our energy intensive agricultural system in a world with limited and finite energy resources emphasizes the need for innovation planning in the future. Similarly, population increases within the State and throughout the world will undoubtedly cause the demand for agricultural products to continually increase. In addition to the high demand for agricultural products, other problems indigenous to our modern society must be overcome if our full potential for agricultural growth is to be achieved in the future. These problems include: increasing

urbanization and the subsequent removal of prime agricultural lands from production, the economics of agriculture in a rapidly changing economic state, the effect and subsequent management of agricultural land uses as it affects our quality of life and the environment, governmental regulation and conditions of marketing and the availability of efficient and economic labor related programs.

Agriculture, grazing and forestry are first elements in the use of the land. Although the production of food and fiber can be viewed as renewable resources, because of tremendous increases in population pressure and energy and economic related limitations it has become apparent that productive land is almost beyond value. In addition to its enhanced traditional role of providing food and fiber, the preservation of agriculture as an open space type land use contributes to our high quality of life by maintaining the quality of the natural environment through the effects that plants and soil have on air and water supply; by providing wildlife habitats and private outdoor recreational areas; by providing opportunities for the recycling of urban solid and liquid wastes through the plant-soil system; and by providing productive, taxable, privately-maintained open space for the aesthetic enjoyment of our urban population.

## Agriculture in North Central Florida

Agriculture remains a major land use in the region with about 1,415,130 acres of 2,211 square miles in farm land as reported in the 1974 Census of Agriculture. More recent figures (1976 Council estimates) indicate the presence of approximately 1,785 square miles of agricultural land use in the region. The difference between the two may largely be attributable to the inclusion of farm woodlands in the earlier figure. For comparative purposes, it is noted that agriculture occupies about 26% of the land area in the region. In contrast, forested lands make up 58% (3,960 square miles) of the region's land area, wetlands cover 8% (545 square miles), developed lands cover 3.7% (250 square miles) and open water and miscellaneous land uses occupy the remainder of the region.

It is apparent from Table 19, County Agricultural Summary (1974), that agriculture is a major industry in the region. At that time, there were 5,011 farms in the region whose average size varied by county from 158 to 1,142 acres. Approximately one-half of the farm land in each county was used for crop production. The remaining farm lands can be classified as pasture and used to a lesser extent for orchards, horticultural products and other uses. It is noteworthy that the total value of agricultural products marketed in 1974 exceeded $140 million for the region and represented a sizeable income for many counties. As utilized in this report, it should be noted that the 1974 Census of Agriculture defines a farm as "any place from which $250 or more of

TABLE 19
COUNTY AGRICULTURAL SUMMARY (1974)+

| COUNTY | FARM LAND (ACRES) | PERCENT OF LAND AREA | FARMS NO. | AV. FARM SIZE (AC.) | CROPLAND (ACRES) | TOT. FARM PRODUCTION EXPENSES ($1000) | TOT. VALUE AGRICULTURAL PRODUCTS ($1000) |
|---|---|---|---|---|---|---|---|
| Alachua | 273,763 | 46.7 | 915 | 299 | 111,838 | 17,559 | 20,581 |
| Bradford | 49,595 | 26.4 | 313 | 158 | 19,420 | 9,983 | 10,887 |
| Columbia | 140,400 | 28.0 | 586 | 240 | 65,832 | 13,928 | 16,821 |
| Dixie | 97,081 | 21.9 | 85 | 1,142 | 8,766 | 85 | 428 |
| Gilchrist | 95,424 | 43.1 | 332 | 287 | 52,940 | 4,870 | 6,467 |
| Hamilton | 104,610 | 31.8 | 352 | 297 | 50,674 | 9,385 | 11,779 |
| Lafayette | 81,495 | 23.2 | 319 | 255 | 36,756 | 14,398 | 16,155 |
| Madison | 168,187 | 37.4 | 659 | 255 | 80,561 | 15,471 | 17,134 |
| Suwannee | 228,804 | 52.1 | 1,054 | 217 | 128,382 | 26,902 | 32,513 |
| Taylor | 115,327 | 17.2 | 189 | 610 | 12,218 | 1,603 | 1,807 |
| Union | 60,444 | 39.2 | 207 | 292 | 17,061 | 4,628 | 6,160 |

+See Appendix 3

Source: 1974 Census of Agriculture, U.S. Department of Commerce, Issued June, 1977.

agricultural products were sold, or normally would have been sold, during the census year, or any place of 10 acres or more from which $50 or more of agricultural products were sold, or normally would have been sold, during the census year."

Agriculture has been one of the region's most stable industries, yet in some ways, its vitality appears to be declining. Examples may be drawn from the 1974 Census of Agriculture which provides data for the five year 1969 to 1974. During this period, the total number of farms in the region decreased from 5,364 to 5,011, a decline of 7%. Dixie and Taylor Counties suffered a 24% and 15% loss in farms respectively, the greatest relative decrease in the region. The total farm acreage likewise decreased about 13% and the average farm size was reduced 6%. During this same time period, total production expenses increased an average of 72% in the region and the total value of agricultural products kept pace increasing 81% for the region. Table 20, Changes in Agriculture, summarizes the general changes in agriculture which have occurred in the region on a county by county basis.

Based upon the 1974 Census of Agriculture, and supplemented with current information contributed by County Agricultural Extension Directors, it is possible to obtain an overview of agricultural production in the region. In general, the major crops produced within the region, in terms of market value, include corn and grains, tobacco and hay crops. Important livestock production centers around poultry and poultry products, beef cattle and swine. Other notable large crops significant to several counties include watermelon and forest products.

Farmers in the region also produce a number of smaller crop products which illustrate the diversity of the region's agricultural potential. These include miscellaneous vegetables, fruits, nuts and berries, dairy products, horses and turkey. In general, these crops contribute a small but increasingly important source of income to the counties in which they are produced. Specific information pertaining to the quantity and market value of agricultural products generated within the region will be maintained in Council files and utilized as necessary to assist in land use and agricultural planning efforts.

## Problems and Values of Agricultural Land

In developing natural land for agricultural uses, native vegetation is cleared away and crop plans maintained in their place. In brief, a naturally diverse community is replaced with a monoculture. Herbicides and insecticides are commonly used to maintain and optimize the growth of a few preferred plan species and to help prevent their utilization by organisms other than those beneficial to man. As the size of agricultural

TABLE 20
CHANGES IN AGRICULTURE+
1974 - 1969

| COUNTY | NUMBER OF FARMS | | ACRES IN FARMS | | AVERAGE FARM SIZE IN ACRES | | TOT. PRODUCTION EXPENSES X $1000 | | TOT. VALUE OF AG. PRODUCTS X $1000 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1974 | 1969 | 1974 | 1969 | 1974 | 1969 | 1974 | 1969 | 1974 | 1969 |
| Alachua | 915 | 906 | 273,763 | 304,117 | 299 | 336 | 17,559 | 13,130 | 20,581 | 14,539 |
| Bradford | 313 | 363 | 49,595 | 58,506 | 158 | 161 | 9,983 | 10,139 | 10,887 | 11,408 |
| Columbia | 586 | 625 | 140,400 | 153,449 | 240 | 246 | 13,928 | 9,135 | 16,821 | 9,708 |
| Dixie | 85 | 114 | 97,081 | 165,354 | 1,142 | 1,450 | 512 | 407 | 428 | 482 |
| Gilchrist | 332 | 334 | 95,424 | 100,085 | 287 | 300 | 4,870 | 3,046 | 6,467 | 3,293 |
| Hamilton | 352 | 402 | 104,610 | 113,867 | 297 | 283 | 9,385 | 4,537 | 11,779 | 5,576 |
| Lafayette | 319 | 325 | 81,495 | 75,907 | 255 | 234 | 14,398 | 5,030 | 16,155 | 6,008 |
| Madison | 659 | 737 | 168,187 | 205,356 | 255 | 279 | 15,471 | 7,131 | 17,134 | 8,279 |
| Suwannee | 1,054 | 1,091 | 228,804 | 275,160 | 217 | 252 | 26,902 | 12,230 | 32,513 | 13,451 |
| Taylor | 189 | 225 | 115,327 | 106,199 | 610 | 472 | 1,603 | 917 | 1,807 | 992 |
| Union | 207 | 242 | 60,444 | 73,737 | 292 | 305 | 4,628 | 3,648 | 6,160 | 4,080 |

+See Appendix 3

Source: 1974 Census of Agriculture

fields and the intensity of their management increase, their value to species other than man diminishes. Frequently, the side affects of intensive land management, such as runoff with its load of fertilizers, pesticides and soil, has an adverse impact beyond boundaries of the land being managed. These and other problems related to farming present potential hazards to neighboring ecosystems as well as to the agricultural land itself.

Water and wildlife may be used as two examples to illustrate unnecessary resource depletion where conservation practices are not efficiently utilized. Because water control and development require a delicate balancing of all hydrologic, economic and human influences within watersheds, cultivation and cropping practices must have an essential regard for water control on a local as well as regional level. Damage to wildlife may result primarily through a reduction in habitat where cover, feed and water are removed or altered from their natural state. Although a considerable amount of this is to be expected with some agricultural uses of land, good conservation farming employing such practices as grassed waterways, vegetated slopes, farm ponds and other modifications often results in the support of more wildlife compatible to farms.

Although there is little doubt that crop land development and use may have an adverse impact on related resources such as forest and prairies, some of this development is justifiable because of the high priority that necessarily must be assigned to agricultural land. Therefore, because of economics, product need and demand and the intangible values attributed to land for this use, conservation approaches to agricultural land should be continually encouraged. This type of encouragement is being provided in each county by the County Agricultural Extension Service, the Soil Conservation Service and the Soil Conservation and Stabilization Service, which promote wise management of all elements of the resource base. In addition, because agriculture has become an important aspect of the ecology of the region, the retention of well managed and productive farm lands should be considered of equal importance to forest and wetland areas.

In addition to the problems described as indigenous to the proper management of farm lands such as those concerning erosion, irrigation and agricultural runoff, a number of other problems have been identified by the County USDA Agricultural Agents. These problems, many of which are common to all farmers, must be recognized at an early stage of land use planning in order that proper consideration may be made wherever possible through the comprehensive planning process. These problems include:

1) Increasing farmland prices will make it difficult to young people to become farmers in the future unless they have grown up on a family farm.
2) There is a need for more research and educational programs on agricultural land management, including pest, weed and disease control.

3) Urban sprawl and the breaking up of farms due to economic pressures of developers is slowly reducing the amount of farmland available for agriculture.
4) Land prices are rapidly increasing making it very difficult for farmers to expand their working base.
5) Increasing taxes often place a disproportionate share of the community financial burden on farmers and discourages the preservation of agricultural lands.
6) It will become necessary to insure adequate water allocations for irrigation through water resources planning.
7) Greater efficiency in cropland and cleared land management is necessary to retard wind and water caused soil erosion.
8) The level of education of farms must be improved so that the benefits and practices of modern farming technology might be better understood and implemented within the region.
9) The availability of a financial planning and advisory service for farms would help facilitate sound farm planning.

## Agriculture and Soils

Because the type, quantity and quality of any vegetation depends in large degree upon the type of soil in which that vegetation occurs, planning around soil types is integral to good agricultural land management.

The U.S. Soil Conservation Service has established a capability classification for soils by which soil groups are categorized as to their general suitability for agricultural use. This is a practical grouping based upon limitations of the soils, the risk of damage when they are used and the way they respond to treatment. The eight capability classes are designed by Roman Numerals I-VIII. Soils in Class I have few limitations, the widest range of use and the least risk of damage when they are used. Those in the other classes have progressively greater natural limitations. Soils in Class VIII are rough, shallow or otherwise limited so that they do not produce worthwhile yields of crops, forage or wood products. Table 21 summarizes the eight classes in the SCS agricultural capability system.

For the purpose of broadly recognizing areas of north central Florida which exhibit various qualities or potential for agriculture, the 59 soil associations described in the General Soils Atlas for each of the eleven counties in the region was evaluated. A simple analysis was performed for each association in which a numerical value was assigned on the basis of its agricultural capability class, limitations to agriculture (wetness, erosion, etc.) and potential for crops. With the assistance of USDA soil scientists the soil associations were grouped into five general categories and ranked according to their relative potential or suitability

TABLE 21
AGRICULTURAL CAPABILITY CLASSIFICATION FOR SOILS

| CLASS | DESCRIPTION |
|---|---|
| I | Soils have few limitations that restrict their use. |
| II | Soils that have some limitations that reduce the choice of plants that require moderate conservation practices. |
| III | Soils have severe limitations that reduce the choice of plants or that require special conservation practices or both. |
| IV | Soils that have very severe limitations that restrict the choice of plants or that require very careful management or both. |
| V | Soils that are not likely to erode, but have other limitations, impractical to remove, that restrict their use largely to pasture, woodland, or food and cover for wildlife. |
| VI | Soils that have severe limitations that make them generally unsuitable for cultivation and that restrict their use largely to pasture, range, woodland, or wildlife. |
| VII | Soils that have very severe limitations that make them generally unsuitable for cultivation and that restrict their use largely to grazing, woodland or wildlife. |
| VIII | Soils and landforms that have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to aesthetic purposes. |

Source: General Soils Atlas for Planning Districts III and IV, 1974.

for agriculture. Table 22, Agricultural Potential for Soil Associations, illustrates the soils categories defined by this analysis. The Agricultural Suitability Map contained herein visually reflects the areal distribution and ranking of these soil associations.

In summary, the agriculture industry in north central Florida is essential to its economic well-being and important to meet growing demands for agricultural products. Although poor agricultural management practices can have serious effects upon surrounding ecosystems as well as the agricultural land itself, the importance of sound management is generally recognized by the farmers of the region and encouraged by County Agricultural Extension Agents and the USDA Soil Conservation Service.

TABLE 22

AGRICULTURAL POTENTIAL OF SOIL ASSOCIATIONS

| HIGH | MODERATE | FAIR | POOR | VERY POOR |
|---|---|---|---|---|
| Dothan-Orangeburg-Red Bay | Leefield-Mascotte-Albany | Scranton-Basinger-Myakka | Leon-Plummer | Fresh Water Swamp |
| Kendrick-Hague-Zuber | Arredondo-Zuber | Arredondo-Kanapaha | Alpin-Blanton | Alluvial Land-Swamp |
| Faceville-Carnegie--Orangeburg | Stilson-Pelham-Mascotte | Leon-Mascotte-Rutledge | Surrrency-Portsmouth | Freshwater Swamp |
| Ardilla-Leefield-Stilson | Blichton-Flemington-Kanapaha | Broward-Matman-Osier | Osler-Rutledge-Leon | Salt marsh - Coastal Dunes |
| Orangeburg-Lucy-Dothan | Jonesville-Chiefland-Archer | Myakka-Wauchula-Placid | Brighton-Dorovan | |
| Susquehanna-Bowie | Sparr-Lochloosa-Tavares | Lynne-Pomona-Pompano | Martel-Placid | |
| Hernando-Archer-Chiefland | Meggett-Wauchula-Chobee | Chipley-Leon-Plummer | Blanton-Kalmia-Swamp | |
| Archer-Chiefland | Manatee-Felda | Tavares-Myakka-Basinger | | |
| Fellowship-Hague-Blichton | Manatee-Felda-Copeland | Blanton-Kanapaha | | |
| Eureka-Paisley-Eaton | Portsmouth-Rains | Plummer-Rutledge | | |
| | Brighton | Pelham-Plummer-Rutledge | | |
| | Okeechobee-Terra Cela-Tomoka | Blanton-Chiefland | | |
| | Blanton-Susquehanna-Bowie | Blanton-Lakeland | | |
| | Chipley-Albany-Rutledge | Leon-Mascotte-Surrency | | |
| | Adamsville-Chiefland-Blanton | Chipley-Leon-Osier | | |
| | Arredondo-Alaga-Kenney | Chipley-Blanton-Swamp | | |
| | Blanton | Chandler-Apopka | | |
| | Chipley-Chiefland | Alpin-Blanton-Eustis | | |
| | Chipley-Albany-Plummer | | | |
| | Kanapaha-Chipley-Scranton | | | |

NORTH CENTRAL FLORIDA

# SOIL POTENTIAL FOR AGRICULTURE

Increasing Suitability for Agriculture

MILES

KILOMETERS

1978

North Central Florida Regional Planning Council

# FORESTRY

## General

Forests cover approximately one-third of the total land area of the United States. Although forest types vary considerably between regions, most produce, or are capable of supporting, five basic resources including water, wildlife, timber, recreation and domestic forage.

As evidenced by rapidly rising prices for forest products, the present level of forest productivity is inadequate to meet current demands. Total wood consumption is currently about 2,750 pounds per capita annually and the demand for paper and wood products is expected to more than double by the year 2000. Yet the forest land base is steadily declining with over 500,000 acres lost nationally each year to other uses. Studies by the U.S. Forest Service indicates that forest lands can be made to sustain much larger annual harvests than at present. It appears that the solution is not one primarily of providing more space, but of wise management of forest lands. At the present time, only a relatively few foresters and private owners are actually supervising the maintenance of our forests during a period which could have significant national consequences.

This eleven county region of north central Florida contains a large amount of forested lands and is dependent on its forests and wood using industries for much of its income. A consideration of our forests as one of our most significant natural resources is essential.

## Forestry in North Central Florida

This eleven county north central Florida region, according to the Florida Division of Forestry publication entitled Timber for Tomorrow, contains 4,278,800 acres of land of which approximately 3,215,500 acres are forested. An estimated 11,034 acres are considered non-productive or are reserved from production, leaving 3,204,466 total acres of forested land in the region. This amount is defined as commercial forest land in the region or for the purposes of this report, simply as forest land which is producing or capable of producing crops of industrial wood and not withdrawn from timber production.

Table 23, entitled Forest Land by County, illustrates the forest land area distribution within the region. The significance of this major land use is apparent with forested lands covering from 46% to 91% of each county and a total forest land area for the region of 73.2%. This amount

TABLE 23
FOREST LAND BY COUNTY*

| COUNTY | LAND AREA | FOREST LAND | PERCENT FOREST |
|---|---|---|---|
| Alachua | 588.2 | 311.4 | 52.9% |
| Bradford | 188.5 | 148.1 | 78.6% |
| Columbia | 515.3 | 385.2 | 75.6% |
| Dixie | 456.7 | 393.6 | 86.2% |
| Gilchrist | 227.0 | 150.8 | 66.4% |
| Hamilton | 329.0 | 252.2 | 77.0% |
| Lafayette | 352.0 | 294.7 | 83.8% |
| Madison | 456.8 | 323.9 | 70.9% |
| Suwannee | 439.1 | 204.2 | 46.6% |
| Taylor | 668.2 | 607.0 | 91.5% |
| Union | 158.0 | 133.8 | 84.7% |
| TOTAL | 4,378.8 | 3,204.5 | 73.2% |

*See Appendix 3

Source: Forest Statistics for Northeast Florida, 1970.

is equal to about 20% of the state's total commercial forested lands, making this the second largest forested region in Florida.

Within the region, land ownership is dominated by the forest industry which owns approximately 58.7% of all forested lands. Farm holdings of forest lands are second with 18.3%, followed by 15.1% held by private owners, 4.8% by private corporations, 2.3% in National Forests and less than 1% by state and other public owners.

Of the industry owned forested lands, the pulp and paper companies own 39% and fairly well dominate the forest practices of the region. Miscellaneous private and corporate owners together own more land than the farmer. Rapid increases in private ownership are primarily due to investments in rising land values more than in anticipated returns of yeilds from the soil. Table 24, Area of Forest Land by Ownership and County, illustrates the breakdown of forest lands by owner in the region. A significant degree of land ownership by the forest industry is particularly evident by ownership percentages exceeding 50% in Dixie (93%), Taylor (83%), Lafayette (75%), Hamilton (57%), and Union (57%) Counties. There is no other ownership in the region which exceeds 50% of the land area in any one county.

TABLE 24
AREA OF FOREST LAND BY OWNERSHIP AND COUNTY*+ (1970)

| COUNTY | TOTAL FOREST | OWNERSHIP | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | NATIONAL FOREST | STATE | COUNTY AND MUNICIPAL | FOREST[1] INDUSTRY | FARMER | MISC. PRIVATE | |
| | | | | | | | CORPORATE | INDIVIDUAL |
| Alachua | 311.0 | -- | 6.7 | 0.4 | 11.1 | 96.4 | 35.5 | 60.9 |
| Bradford | 148.1 | -- | 8.4 | 1.1 | 73.4 | 21.7 | 10.9 | 32.6 |
| Columbia | 385.2 | 73.0 | 0.05 | 0.3 | 121.6 | 97.6 | 43.9 | 48.8 |
| Dixie | 393.6 | -- | 0.4 | 0.3 | 385.0 | 1.3 | 1.3 | 5.3 |
| Gilchrist | 150.8 | -- | 0.1 | 0.3 | 56.8 | 50.4 | 14.4 | 28.8 |
| Hamilton | 252.2 | -- | 0.05 | -- | 143.9 | 22.8 | -- | 85.5 |
| Lafayette | 294.7 | -- | -- | 0.4 | 222.4 | 27.8 | 14.0 | 30.1 |
| Madison | 323.9 | -- | 0.05 | -- | 158.6 | 122.0 | -- | 43.3 |
| Suwannee | 204.2 | -- | -- | 0.1 | 29.6 | 90.7 | 7.0 | 76.8 |
| Taylor | 607.0 | -- | 0.1 | 0.3 | 502.9 | 8.7 | 25.9 | 69.1 |
| Union[2] | 133.8 | -- | 5.1 | -- | 76.5 | 48.2 | -- | 4.0 |
| TOTAL | 3,204.5 | 73.0 | 20.95 | 3.2 | 1,881.8 | 587.6 | 152.9 | 485.2 |

+See Appendix 3

*Land area given in thousands of acres

[1]Does not include farmer owned and misc. private lands leased to forest industry.

[2]Union County also contains less than 50 acres of land in federal ownership

Source: Forest Statistics for Northeast Florida, 1970.

TABLE 25
FORESTED LAND BY TYPE AND AREA*+

| COUNTY | TOTAL FOREST | FOREST TYPES | | | | |
|---|---|---|---|---|---|---|
| | | LONGLEAF-SLASH PINE | LOBLOLLY-SHORTLEAF PINE | OAK-PINE | OAK-HICKORY | OAK-GUM-CYPRESS |
| Alachua | 311.0 | 141.7 | 20.3 | 32.4 | 74.4 | 42.2 |
| Bradford | 148.1 | 114.3 | -- | 10.8 | 10.9 | 12.1 |
| Columbia | 385.2 | 194.7 | 9.8 | 26.5 | 56.1 | 98.1 |
| Dixie | 393.6 | 166.2 | 4.2 | 34.4 | 55.0 | 133.1 |
| Gilchrist | 150.8 | 88.7 | -- | 3.6 | 51.3 | 7.2 |
| Hamilton | 252.2 | 151.4 | 2.8 | 33.6 | 8.6 | 55.8 |
| Lafayette | 294.7 | 144.1 | 7.2 | 30.9 | 26.3 | 86.2 |
| Madison | 323.9 | 108.3 | 24.3 | 53.3 | 47.6 | 90.4 |
| Suwannee | 204.2 | 76.8 | 16.8 | 24.4 | 51.9 | 34.3 |
| Taylor | 607.0 | 280.5 | 47.4 | 54.5 | 32.2 | 192.4 |
| Union | 133.9 | 88.8 | -- | 14.5 | 12.0 | 18.5 |
| TOTAL | 3,204.6 | 1,555.8 | 132.8 | 318.9 | 426.3 | 770.3 |

+See Appendix 3

*Land areas given in thousands of acres

Source: Forest Statistics for Northeast Florida, 1970.

Because of the conflicting values of land use, such as those lands utilized for housing, public facilities and utilities, as well as pressures for additional lands for recreational use, the amount of land available for forestry, as for other forms of agriculture, is most likely to continually decrease in future years. And although some lands will undoubtedly revert to forestry use, such as agricultural lands which might be put to tree farming, it is not likely that minor land use changes will be significant and that commercial forestry practices will extend to poorer quality land. It is more likely that increasing trends for more intensive forest management will continue coupled with an overall gradual decline in the area of commercial forest lands.

From Table 25, Forested Land by Type and Area, it may be seen that over 60% of the total forested lands in the region consist of pine forests. Longleaf and slash pine forests dominate the region, covering 48.6% of the forested land area. Loblolly and shortleaf pine forests add another 4.1% to the total area of pine forests. Oak-gum-cypress forests are the second largest category with 24% of the forested land area, followed by 13.3% in oak-hickory forests and 9.9% in oak-pine forests.

## Measures of Forest Quality

There are two parameters commonly employed as measures of forest quality. These are stocking class and site class ratings. These parameters are described as follows:

Growing stock trees are defined as living trees of any commercial species qualifying as desirable or acceptable trees. The amount of land well-stocked with such trees is a good indicator of forest management practice.

Stocking values are usually expressed as a percentage and do not necessarily reflect an actual volume of timber. That is, the stocking standard is based upon the number of acceptable trees per acre by total numbers when under 5 inches in diameter. When over 5 inches in diameter, the minimum basal area is used and expressed in square inches to determine the percent stocking value. Values are determined by sampling a statistical number of trees occurring in each unit area meeting minimum standards. By awarding a number of stocking percentage points for each sample group evaluated, it is possible to exceed 100%. For example, the minimum number of seedlings per acre for full stocking would be 600 and for full stocking of an area of trees with a 10 inch diameter at breast height (D.B.H.) there would be 155 trees per acre with an average minimum basal area of 85 square inches.

Stocking percentages for the purposes of comparing forested areas are classified as follows:

Overstocked, greater than 130%
Fully stocked, 100-130%
Understocked, less than 16.7%
Medium stocked, 60-99%
Poorly stocked, 16.7-59%

The amount of land well-stocked with growing stock trees is a good indicator of forest management practices. From Table 26, Forest Land by Stocking Class, it can be seen that for the region as a whole, 59.2% of all forested lands can be considered to be fairly well-stocked, i.e. 60% or better stocked. In addition, it appears that Bradford, Dixie, Hamilton and Union Counties have the highest percentages of medium to well stocked lands in the region.

TABLE 26
FOREST LAND BY STOCKING CLASS AND COUNTY, 1970*

| COUNTY | TOTAL FOREST | STOCKING PERCENTAGE | | | | |
|---|---|---|---|---|---|---|
| | | OVER 130 | 100-130 | 60-99 | 16.7-59 | BELOW 16.7 |
| Alachua | 311.0 | 10.1 | 33.8 | 131.7 | 101.3 | 34.1 |
| Bradford | 148.1 | 3.4 | 34.2 | 78.8 | 26.3 | 5.4 |
| Columbia | 385.2 | 15.3 | 68.9 | 143.4 | 128.8 | 28.9 |
| Dixie | 393.6 | 16.6 | 62.7 | 191.7 | 82.6 | 40.0 |
| Gilchrist | 150.8 | 3.8 | 22.0 | 47.9 | 51.6 | 25.5 |
| Hamilton | 252.2 | -- | 42.1 | 117.9 | 77.4 | 14.8 |
| Lafayette | 294.7 | 7.2 | 53.0 | 79.1 | 102.8 | 52.6 |
| Madison | 323.9 | -- | 57.2 | 122.7 | 111.5 | 32.5 |
| Suwannee | 204.2 | 3.5 | 31.4 | 68.6 | 56.0 | 44.7 |
| Taylor | 607.0 | 8.9 | 90.7 | 243.2 | 203.7 | 60.5 |
| Union | 133.8 | -- | 35.8 | 74.4 | 19.6 | 4.0 |
| TOTAL | 3204.5 | 68.8 | 531.8 | 1299.3 | 961.6 | 343.0 |

* See Appendix 3

+ Land area given in thousands of acres.

Source: Forest Statistics for Northeast Florida, 1970.

The site class rating is a classification of forest land in terms of its natural capacity to grow crops of industrial wood based on fully stocked natural stands. The rating is indicative of the ability of an area to produce a desirable rate of timber growth and is related to the value of land for forest purposes. The scale is listed as follows:

Class 1 - Sites capable of producing 165 or more cubic feet per acre annually.
Class 2 - Sites capable of producing 120 to 165 cubic feet per acre annually.
Class 3 - Sites capable of producing 85 to 120 cubic feet per acre annually.
Class 4 - Sites capable of producing 50 to 85 cubic feet per acre annually.
Class 5 - Sites incapable of producing 50 cubic feet per acre annually by excluding unproductive sites.

Table 27, Forest Land by Site Class and County, suggests that of the total, 3,204,500 acres of forested lands in the region, only relatively few of these lands exhibit a very good environment for high timber production. More recent surveys have indicated that potential timber productivity can be greatly increased through intensive forest management. (Source 31).

The previous two charts are self-explanatory. They illustrate that while large areas of the region are apparently well-stocked and well-managed, large acreages exist where there is a definite need for improvement.

The quality of timber in this region is relatively good. Over half of the softwood and hardwood sawtimber volumes are considered to be of excellent quality. Although pine and other softwoods dominate the region's forests in both sawtimber and growing stock volumes, recent trends to convert hardwood forests to softwoods should at least be partially offset by rising hardwood values.

## Forest Types

The Florida Division of Forestry has broadly classified the forested lands of the state according to the species forming a plurality of live-tree stocking. The following six forest types are found in northern Florida:

Longleaf-slash pine - Forests in which longleaf or slash pine, singly or in combination, comprise a plurality of the stocking. Common associates include oak, hickory, and gum.

Loblolly-shortleaf pine - Forests in which loblolly pine, shortleaf

TABLE 27
FOREST LAND BY SITE CLASS AND COUNTY, 1970+

| COUNTY | FOREST | SITE CLASS | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Alachua | 311.0 | -- | 15.2 | 98.0 | 180.9 | 16.9 |
| Bradford | 148.1 | -- | 5.4 | 35.1 | 102.2 | 5.4 |
| Columbia | 385.2 | -- | 4.9 | 128.5 | 214.9 | 36.9 |
| Dixie | 393.6 | -- | -- | 113.7 | 248.2 | 31.7 |
| Gilchrist | 150.8 | -- | -- | 14.8 | 96.0 | 40.0 |
| Hamilton | 252.2 | -- | -- | 47.8 | 177.6 | 26.8 |
| Lafayette | 294.7 | -- | -- | 42.9 | 189.3 | 62.5 |
| Madison | 323.9 | -- | 3.9 | 52.6 | 238.4 | 29.0 |
| Suwannee | 204.2 | -- | -- | 20.9 | 151.9 | 31.4 |
| Taylor | 607.0 | -- | 4.5 | 177.2 | 341.0 | 84.3 |
| Union | 133.8 | -- | 4.0 | 68.2 | 53.0 | 8.6 |
| TOTAL | 3204.5 | -- | 37.9 | 799.7 | 1993.4 | 373.5 |

+See Appendix 3

* Land areas given in thousands of acres.

Source: Forest Statistics for Northeast Florida, 1970

pine, or other southern yellow pines, except longleaf or slash pine, singly or in combination, comprise a plurality of the stocking. Common associates include oak, hickory, and gum.

Oak-pine - Forests in which hardwoods (usually upland oaks) comprise a plurality of the stocking but in which pines comprise 25 to 50 percent of the stocking. Common associates include gum, hickory, and yellow poplar.

Oak-hickory - Forests in which upland oaks or hickory, singly or in combination, comprise a plurality of the stocking, except where pines comprise 25 to 50 percent, in which case the stand would be classified oak-pine. Common associates include yellow poplar, elm, maple, and black walnut.

Oak-gum-cypress - Bottomland or lowland forests in which tupelo, black gum, sweetgum, oak, or southern cypress, singly or in combination, comprise a plurality of the stocking, except where pines

comprise 25 to 50 percent, in which case the stand would be classified oak-pine. Common associates include cottonwood, willow, ash, elm, hackberry, and maple.

Elm-ask-cottonwood - Forests in which elm, ash, or cottonwood, single or in combination, comprise a plurality of the stocking. Common associates include willow, sycamore, beech, and maple.

The primary tree or forest types harvested and utilized in the region may be categorized into two principal classes: hardwoods and softwoods. The former includes both hard-textured and soft-textured hardwoods and are represented by Florida maple, birch, hickory, dogwood, sweetgum, magnolia and sycamore tree species. Softwoods are coniferous trees, usually evergreen, having needles or scale-like leaves. Examples of soft-woods include loblolly, longleaf, slash, and shortleaf pines, cypress, eastern red cedar and white cedar. Appendix one (1) has been included to illustrate the type and variety of trees and other natural vegetation found in north central Florida.

## Forest Production

According to the Division of Forestry publication, Timber for Tomorrow (1974), the gross annual growth of growing stock in the region slightly exceeds 131 million cubic feet. This volume is reduced by some 11 million cubic feet annually due to timber mortality leaving a net annual growth of 120,599,000 cubic feet. From this resource pool, total annual removals amount to 95,868,000 cubic feet of which 84% is pine and 16% is hardwoods.

The total annual removal of timber for industrial products is approximately 85,168,000 cubic feet of which 47,128,000 cubic feet is utilized by industries in the region. This later amount provides nearly 70% of the raw material needs for wood industries in the region.

Although sawmills use about one third of the total wood volume produced, nearly two-thirds of the sawtimber harvested in the region is delivered to pulp mills. These mills receive about 62% of the softwoods produced and 21% of the hardwoods. Hardwood removals for veneer logs and bolts account for 43% of the remaining hardwood harvest. The wood industry as reported in Timber for Tomorrow, employed 3,445 people in 114 companies during 1974. In that year, total yearly payrolls approached $24 million and shipment values exceeded $100 million. The 28 primary processing plants in the region covert timber to rough cut lumber, veneer, poles, posts, pulpwood and charcoal.

As evidenced by the figures on forest growth and harvest there is, in general, a balanced condition between timber growth and removal in the region. This is reflected by timber removals in specific sectors, for

example; forest growth in the National forest greatly exceeds removals; farmers are cutting only about two-thirds of farm growth and; miscellaneous private and forest industry owners are harvesting about 80% to 90% of their growth respectively.

There are, however, undesirable harvest levels occurring in the region which may eventually adversely affect forest character or quality. Reportedly, the forest industry is seriously overcutting sawtimber growth. Similarly, miscellaneous private owners and farmers are cutting close to the annual sawtimber growth. Over cutting of sawtimber stock appears to be greatest for pine, bay, magnolia and hickory tree species suggesting the possibility of future shortages of sawtimber in these wood types. Despite the gradual decline in forest acreage in the region, the timber inventory is expected to increase during the remainder of the century, due to improving forest management practices.

## Forest Management

Conservation, as applied to forest resources, implies management by man to improve the quality of the forest and increase the potential harvest beyond what nature would do if left alone. The concept of sustained yield is basic to the conservation of forests. In the case of sustained yield, the harvest does not exceed the growth; however, the possible volume of annual harvest varies with the intensity of management from a minimum of natural growth without any management to a maximum limited only by technical expertise and assistance in tree growing. Between the two extremes there lies an economical level of sustained yield for any forest site. The establishment of this optimal level of yield requires extensive work by professional foresters to carefully plan and maintain a long range program for forest management.

There are many sound practices that have been developed for the improved management and maintenance of timber lands. A few of the more common practices include thinning to reduce forest density, pruning lower limbs to reduce knots and upgrade the quality of logs, initiation of a selective logging or continuous harvesting system and many other methods by which experienced foresters can facilitate efficient forest management under any system of commercial forestry.

Problems which must be handled within north central Florida include forest regeneration which must occur where timber stocks have been seriously depleted, combating mortality of timber through fire, disease, and insects, as well as new man-made dangers such as flooding, construction and lowering of the water table. Additional problems which may require future investigation include forest land taxation, forest conversion to pinelands, pollution, the role of the small private land owner in timber production, and other potential problems concerning forest management.

## Map Preparation

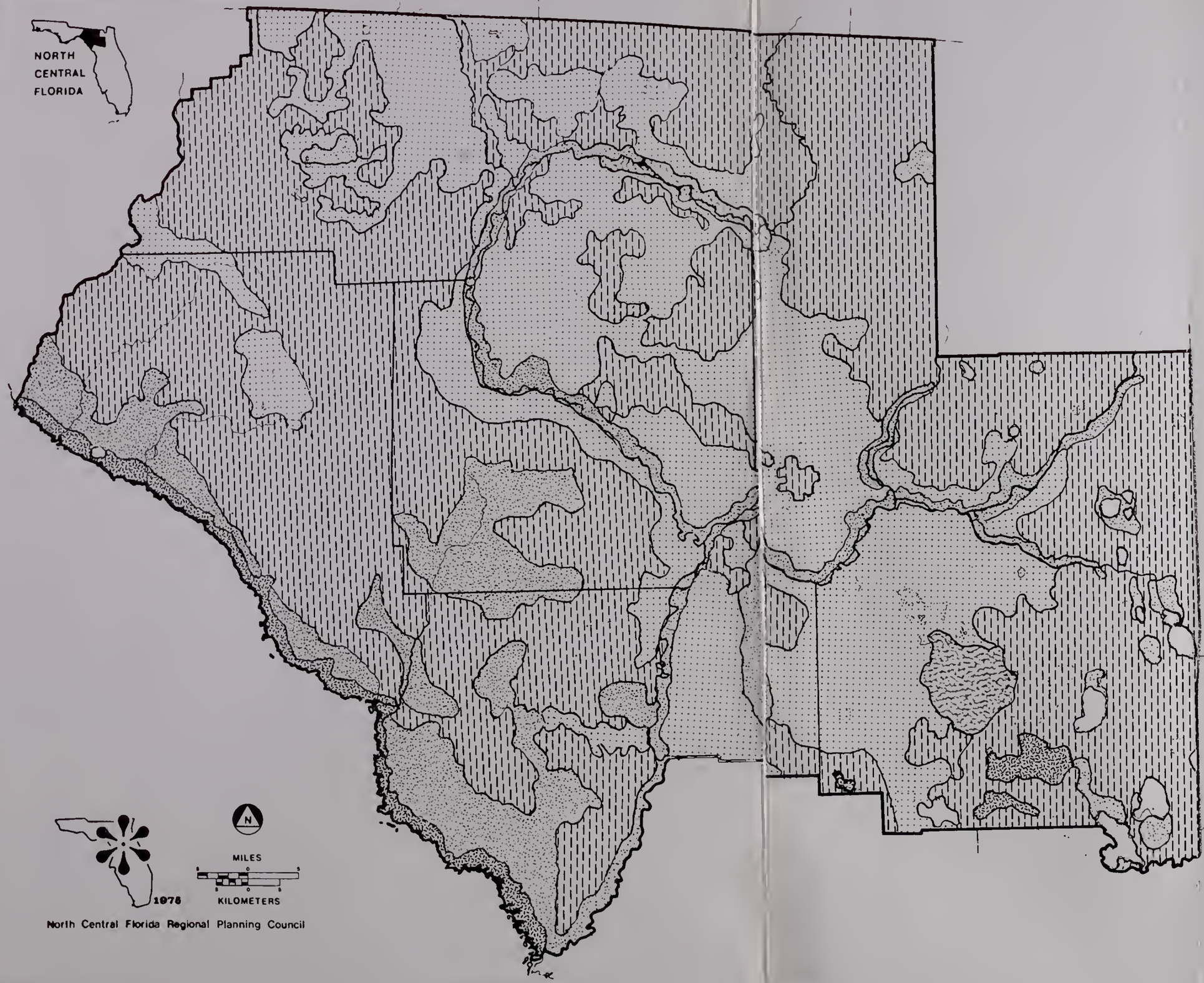
For the purposes of comparing forest resources to other natural resources of north central Florida, it was necessary to categorize forest and other vegetation types into six different groups. These categories were developed and defined with the assistance of County Foresters from the ERTS Satellite Mosaic Map of Florida supplemented with aerial photographs and on-site observations. Listed below are the vegetative categories selected for definition in order of increasing sensitivity to intensive land uses:

1) Non-vegetated (least sensitivity)
2) Agriculture and pasture
3) Pine lands
4) Upland hardwoods
5) Lowland hardwoods
6) Prairie and marsh (highest sensitivity)

These vegetative types are presented for illustration and evaluation on the map entitled General Vegetation.

# GENERAL VEGETATION



Increasing Sensitivity

NON VEGETATED

AGRICULTURE & PASTURE

PINELANDS

UPLAND HARDWOODS

LOWLAND HARDWOODS

PRAIRE & MARSH



1975

MILES

KILOMETERS

North Central Florida Regional Planning Council

# WILDLIFE RESOURCES

## INTRODUCTION

During the early years of this country wildlife was recognized and appreciated for the central role it occupied in sustaining life. It provided products of commercial value, such as furs, and served as a vital component of the food supply. The role of wildlife has changed over the years, but still remains a central component of our outdoor recreation activities. Wildlife is becoming recognized as an increasingly important element in maintaining our quality of life and contributing to the enrichment of modern society.

Along with forests, fish and wildlife are considered to be renewable resources, and as such comprise an essential element in outdoor recreation activities. Consumptive uses of fisn and wildlife include hunting, fishing, food, fertilizer, bait and other uses. Non-consumptive uses of this resource include bird-watching, hiking and nature photography. Increased interest in non-consumptive uses or the aesthetic appreciation of wildlife values has been growing in recent years as a result of an expanding environmental awareness of our citizens.

Fish and wildlife are also important in ways not directly related to recreation. Non-recreation concerns include: the relationship of the well-being of man relative to his ecosystem; the preservation of endangered species; the control of urban and rural pest species; and the biological control of aquatic vegetation by fish or insects. With respect to potential effects on man, the condition of the resource is a useful indicator of the quality of the environment. For example, a decrease in animal species, the death of fish in polluted streams or the loss of animals due to habitat deterioration may illustrate symptoms of environmental decline. It is apparent that conservation, or the wise use of wildlife resources, often requires intensive management it all species are to survive and to continue to proliferate. The acquisition, preservation, and enhancement of fish and wildlife habitat are essential for man's present enjoyment and for the benefit of future generations.

# WILDLIFE HABITAT

The wildlife of an area is dependent on many factors, vegetation being the most important. Each plant community has a characteristic animal community, the combination of which is considered a biological community, and an ecosystem is simply defined as the biological community and its non-living environment. Biological communities are normally named for the more abundant or dominant species, usually a plant.

In general, plant communities may be subdivided into two vary broad categories, upland communities and lowland or wetland communities. Upland communities of north-central Florida include sandhills, mixed hardwoods and pine, hammocks, and pine flatwoods. Lowiand communities include swamp forests, wet prairies, salt marshes and submerged lands. A brief description of each community along with characteristic animal species is provided in following sections. In addition, Appendix 2 is included to provide further elaboration on wildlife species occurring in the region.

## Sandhill Communities

Sandhill communities typically occur on well-drained sandy soils and may usually be identified by the typical longleaf pine-turkey oak vegetative association. In general, due to the harsh conditions imposed by poor soil quality, low moisture and high fire potential, the community has a low tree diversity. It possesses a low understory composed of herbaceous plants such as wiregrass and yellow fox glove.

In general, many of the animals found in such areas are burrowers due to the often high temperatures and absence of water. Species such as indigo snakes, gopher tortoises, desert lizards, ground doves, bobwhites, fox squirrels and pocket gophers are cited as typical vertebrae associated with the sandhill community.

## Mixed Hardwood and Pine Communities

Mixed hardwood and pine communities are typically found on the clayey soils of Madison and Taylor Counties. They represent the southern most extension of the southern Piedmont mixed hardwood forest. The natural climax vegetation of the community is characterized by an American beech-Southern magnolia-Florida Maple Association along with numerous other hardwoods. Animal species vary with the successional stage of the forest

but typically include broadly adapted species such as cottontails and bobwhites as well as the barred owl, red bellied woodpecker, white-tailed deer, grey squirrel, shrews, gray fox and cotton mouse.

## Hammocks

Hammocks, as defined in the Florida Environmentally Endangered Lands Plan, are a cluster of broad-leaved trees, often evergreens, usually growing on relatively rich soil. They are noted as the climax vegetation of most areas of central and peninsular Florida. Characteristic trees in the north-central Florida region include live oak, cabbage palm, magnolia, laurel oak and American holly. San Felasco hammock in Alachua County is a good example of this type of community. Typical animals in the hammock community include the spadefoot toad, tufted-tit mouse, great-created flycatcher, golden mouse, wood rat and flying squirrel.

Based upon a recently completed qualitative survey assessing wildlife values of Florida's plant communities, the Game and Fresh Water Fish Commission has recognized hardwood hammocks as first priority communities. Such a designation indicates those communities most deserving of protection based upon estimated wildlife values, scarcity within the watershed and endangerment of the plant community (Source 2).

## Pine Flatwoods

Pine flatwoods are by far the dominant plant community in the Gulf coastal zones and are widespread throughout the region. Soils are usually sandy with a moderate amount of organic materials in the surface layers. The great majority of upland areas of Dixie and Taylor Counties are covered with pine flatwoods forests. Most of these are effectively managed by the large lumbering and pulp industry which owns vast tracts within this area.

In generaly, flatwoods have a low diversity of tree species. Many understory plants common to flatwoods are wire grass, saw palmetto, wax myrtle, mulberry, and fetterbush. Often found within large pine flatwoods forests are small cypress ponds, bayheads, and other forest types typical of wetter environments emphasizing the rather poorly developed drainage.

Pine flatwoods are noted as having fairly numerous and diverse animal population. Larger animals such as deer, bear, bobcat, racoon and gray fox are commonly found near boundaries between flatwoods and associated forest communities. Other typical animals common to flatwoods include

the black racer, brown-headed nuthatch, fox squirrel, cotton rat and cottontail rabbit. Wildlife values can very considerably depending upon the degree and type of forest management applied.

## Swamp Forests

Swamp forests, or deciduous hardwood swamps, are found bordering rivers and basins where the forest floor is saturated or is submerged during a portion of each year. Such communities are characterized by hardwoods such as black gum, water rupulo, red maple, sweetgum, water oak and water hickory. Other typical trees might include the bald cypress and cabbage palm. Understory vegetation typically consists of buttonbush, wax myrtle, American hornbeam and elderberry. Although swamp forests occupy only a relatively small portion of the region, they provide for a very wide diversity of plant and animal species. Within the study are swamp forests are typically encountered along the flood plains of the Suwannee, Steinhatchee, Santa Fe and Econifina Rivers.

Animals inhabiting these areas include species such as the bobcat, deer, turkey, grey squirrel, otter, pileated woodpecker, wood duck, as well as numerous other birds, turtles and snakes. In general, the productivity of both plant and animal systems in swamp forests is very high because of the diverse habitat, the availability of nutrients, and the periodic flooding and drying essential to the maintenance of this system.

## Wet Prairie

Wet prairies and freshwater marshes cover a very limited area in north central Florida. They are defined by any grass-sedge-rush community occurring in an area where the soil is saturated or covered with water two or more months of the year. Paynes Prairie is the most notable example of this type of vegetative community in the region but occurrances are also noted in western Madison County, and northern Columbia County.

Prairie communities are generally very productive in wildlife. Numerous wading birds, water fowl, frogs and other amphibians inhabit such areas. Many rare and/or endangered species heavily rely upon this habitat including the wood stork, sandhill crane and Florida round-railed muskrat.

## Salt Marshes

Salt marshes are plant communities that have developed in inter-tidal zones along low energy coasts. Tidal marshes extend along the full length of the coast of Dixie and Taylor Counties, broken only by streams and a very few areas of beach. In such areas, only a few inches of vertical elevation may determine a suitable habitat for a given species or community. Salt marsh grass, Spartina alterniflora often forms an almost pure stand as an outer band of the salt marsh where it is exposed to the deepest and longest inundation by salt water during high tide. The black rush, Juncus roemerianus is commonly found on slightly higher ground in the coastal marshes of Dixie and Taylor Counties. The species existing in any one area are usually dependent upon the degree of inundation by tides as well as the salinity of the water.

Salt marshes are of particular importance to Florida. Nutrients from the land and sea combine to produce more protein than some of the most intensively managed farms. Many commercial fish such as the spotted sea trout, mullet, redfish and others spend much of their lives in the productive wetland areas afforeded by marshes. In addition, crabs, oysters, some species of clams, several species of shrimp and other Gulf marine life depend on the salt marsh for food, protection and breeding. Other animal species which abound in the salt marsh ecosystem include birds. Rails, egrets, gulls, terns, and seaside sparrows are relatively common to coastal marshes and depend upon that system for food. In addition, the diamond-back terrapin, salt marsh snake, mink otter and racoon are also noted as characteristic animals.

## Submerged Lands

Submerged lands and their communities are those salt water ecosystems which merge the coastal marshes at their landward limits and extend westward into the Gulf. Submerged lands are those generally lying beneath sea level.

Generally, the salt water systems along the northwestern Gulf coast consist of numerous algae and a few species of seagrass. Seagrasses are defined as flowering plants that grow completely submerged in undiluted sea water. Although there are about 35 species of seagrasses in the world's oceans, only five have been recognized on the continental shelf of the eastern Gulf of Mexico.

Thalassia testudinum or turtlegrass is the most abundant species in this portion of the Gulf of Mexico. The other three species which make up about 90 percent of the biomas of seagrass beds in order of relative

abundance include Syringodium filiformis (Manatee grass), Halodule wrightii (Shoal grass), and to a much lesser extent, small patches of Halophila engelmannii.

With respect to animal species, seagrass plants in general provide food, cover, and attachment sites for small crustacean, shellfish and other invertebrates as well as fish. Most of the important species in Florida's commercial and sport fishery spend a portion of their lives in shallow inland and coastal waters. Many species including oysters, crab, sea trout, and pompano spend much of their lives in such areas. In addition, a variety of reptiles, water fowl, wading birds and aquatic mammals such as the otter and manatee utilize these plants for food or feed upon smaller animal species occupying this habitat. It is reported that sea turtles and manatees feed on seagrasses as well as do some sea urchins, conch, parrot fishes, sturgeon, trigger fish and many others.

The foregoing description is only a brief sampling of the variety wildlife species in the region. A complete list of terrestrial wildlife is quite lengthy; therefore, a representative portion is provided in Appendix 2.

## WILDLIFE MANAGEMENT

With increasing population and pollution, the spread of urban areas, large scale habitat alteration by man, and increasing numbers of sportmen, the quality and quantity of wildlife appears to be diminishing due to the limitations imposed on their numbers and distribution. There is no doubt that wildlife resources must be an integral component in any resource and development project because wildlife is a fundamental part of the total natural environment.

There are three basic methods for maintaining wildlife populations. These include: 1) the preservation or improvement of wildlife habitat; 2) the regulation of harvest or complete protection through game laws and; 3) increasing wildlife stock by artificial means. Of these, the maintenance, development and preservation of habitats is probably the most efficient method to promote wildlife populations. In terms of private contribution to this effort the farmer plays a major role in provision of habitats as evidenced by the often great number of wildlife that find cover on farm areas.

Game regulations recognize that every habitat has a maximum capacity; and when that capacity for a certain game species is overtaxed by too large a population, the habitat is damaged by over grazing and the population starves. Therefore, hunting and fishing must be based on orderly harvest methods which must not take place in excess of the biological minimum limits which would insure repopulation by that species.

Wildlife refuges play an important role in national and state programs to save threatened or endangered species of wildlife and to provide a haven for others. The Osceola National Forest and the St. Marks National Wildlife Refuge represent the federal lands in the region where wildlife populations are protected and managed yet maintained for public utilization. Similarly, state preserves are utilized for the protection and propagation of the natural environment and attendent wildlife species. In north central Florida, state preserves are represented by Paynes Prairie and San Felasco Hammock in Alachua County and Oleno State Park in Alachua and Columbia Counties.

The Florida Freshwater Fish and Game Commission leases or owns many widely scattered wildlife management areas throughout the State including seven in this region of north central Florida. These management areas often receive the heaviest use from sportsmen. In return for compensation from the State, leased timber industry lands receive a low level of wildlife management from trained wildlife officers and a degree of favorable public relations. There appears to be a distinct need for a mechanism whereby Commission biologists can more efficiently interact with owners of wildlife management areas to promote improved wildlife and habitat management. Future consideration of this need by appropriate public agencies appears warranted.

In addition to wildlife management areas, the State supervises six fish management areas in the region which also receive a degree of professional supervision. Table 28 below lists fish and wildlife management areas in the region.

In addition to organized State managed programs for fish and wildlife management areas, many of the forest industry firms permit hunting on some or all of their holdings. Some of these firms either lease land to hunting clubs or allow access to individual hunters for a nominal fee. In this way, each company is in a better position to exercise some degree of control over the land than if the public were permitted indiscriminate access. Fees received from such uses may then be applied toward road maintenance and habitat improvement

Hunting can certainly be considered one of the most important recreational activities in the region and a necessary management tool. Factors that influence hunting potential in the region include climate, water, soils, habitat availability, type and quality wildlife populations, proximity to population centers and rural ownership patterns. In general, three categories of wildlife may be defined including: small game, big game, and waterfowl. Big game include turkey, deer and wild pig; small game include quail, squirrel, rabbit, dove and water fowl. The latter refers primarily to the many duck, coot and associated species found in the region.

TABLE 28
WILDLIFE AND FISH MANAGEMENT AREAS

| FISH MANAGEMENT | COUNTY | ACRES |
|---|---|---|
| Governor Hill Lake | Dixie | 156 |
| Koon Lake | Lafayette | 110 |
| Lake Francis | Madison | 26 |
| Suwannee Lake | Suwannee | 63 |
| Watertown Lake | Columbia | 46 |
| Blue Spring Lake | Taylor | 80 |
| **WILDLIFE MANAGEMENT** | **COUNTY** | **ACRES** |
| Aucilla | Taylor | 165,000 |
| Tide Swamp | Taylor | 20,000 |
| Steinhatchee | Dixie/Lafayette | 382,000 |
| Lockloosa | Alachua | 29,800 |
| Lake Butler | Bradford/Columbia | 109,000 |
| Osceola | Columbia | 157,200 |
| Cypress Creek | Hamilton | 20,000 |

Source: Significant Natural Areas in Planning District Three.

From Table 29, Hunting Potential by County, it may generally be observed that rural counties having large tracts of natural woodland have higher potentials for big game hunting than those with numerous farms. Except perhaps for coastal areas, the region exhibits relativley low hunting potential for water fowl due to the lack of suitable habitat. Heavily farmed areas usually exhibit better hunting potential for small game such as quail and dove which require open fields.

## DETERMINATION OF HABITAT SUITABILITY

For planning purposes, there is a need for a wildlife suitability map describing those areas which have a high potential or suitability for terrestrial wildlife populations. In the absence of other available information, it became necessary to prepare a map based upon a combination of two of the more important factors which determine the habitat suitability for wildlife, i.e., vegetation and land use.

In a general sense, vegetation greatly influences the distribution of wildlife by controlling the type of food present and the availability

TABLE 29
HUNTING POTENTIAL BY COUNTY

| COUNTY | WATERFOWL | BIG GAME | SMALL GAME |
|---|---|---|---|
| Alachua | Low | High | Medium |
| Bradford | Medium | Medium | Medium |
| Columbia | Medium | High | High |
| Dixie | High | High | High |
| Gilchrist | Low | High | High |
| Hamilton | Medium | High | High |
| Madison | Medium | Low | Medium |
| Suwannee | Medium | Medium | High |
| Taylor | High | High | Medium |
| Union | Medium | High | High |

Source: Northeast Gulf River Basins Cooperative Survey, 1977.

of suitable cover in a natural environment. Vegetation groups previously defined were subjectively placed in order of their suitability for wildlife according to their extent and value in the region. A map was then prepared showing wildlife suitability in terms of vegetation.

The second factor to be considered in determining habitat suitability for wildlife was intensity of land use. Because certain land uses greatly restrict the number and type of animals that may inhabit an area, they are an important element in habitat considerations. Land uses were drawn from the general existing land use map of north-central Florida and evaluated in terms of wildlife habitat suitability. By superimposing these maps, it was possible to prepare a composite wildlife suitability map for north central Florida. The value scheme utilized in map preparation is shown in Table 30.

The General Wildlife Suitability Map in the text, generally defines those areas which by virtue of their vegetation and existing land use would favor or restrict the suitability of an area for wildlife. The areas which show the least suitability for wildlife habitat certainly do not imply that those areas are barren of wildlife but only indicate that a limited number of certain type or species may successfully utilize those areas as habitat.

It should also be noted that many small pockets of land with high or low habitat values are scattered throughout the region. Due to their influence on diversity, or "edge effect," these small areas of habitat have a value

TABLE 30
COMPONENTS OF THE GENERAL WILDLIFE SUITABILITY MAP

| VEGETATION | LAND USE | RELATIVE SUITABILITY |
|---|---|---|
| Prairie and Marsh | Lakes and nonforested wetlands | High |
| Lowland Hardwoods | | |
| Upland Hardwoods | Forested areas | |
| Pinelands | Agriculture | |
| Agriculture and Pasture | Urban and built-up | |
| Non-vegetated | Mining | Low |

above their intrinsic scaled value and should be considered of maximum importance to the total area of habitat in which they occur.

In addition, limitation of scale and the generality to which the data available allows maps to be presented restricts the detail to which suitable wildlife habitat areas may be defined. Therefore, the map should not be construed to be all inclusive, but only broadly defines those areas of relative wildlife suitability.

# GENERAL WILDLIFE SUITABILITY

Increasing Suitability

1978

MILES

KILOMETERS

North Central Florida Regional Planning Council

# LAND USE AND NATURAL SYSTEMS

## INTRODUCTION

An overview of previous chapters illustrates that our environment is composed of a complex set of interdependent processes. Virtually all of the natural components of this environment are drawn upon by modern man in one way or another to support our way of life. Perhaps the most relevant examples of the complexity and diverse value assignments given to our resources are reflected in the persistent problems of pollution and energy supply.

It is now clearly recognized that land use decisions must not be made entirely within an economic framework. More importantly, such decisions must be formulated within the context of the limited physical world from which necessary energy and other resources may be drawn to make human growth and development possible. The finite nature of our resources emphasizes the need for their consideration and respect in the land use decision making process. The basic goal of this chapter then is to bring together those natural systems and resources discussed in previous chapters and, combined with a consideration of existing land uses and significant natural areas, outline a basic evaluation system which may be utilized to illustrate relationships between important natural systems in the region.

## SIGNIFICANT NATURAL AREAS

Many kinds of natural areas perform valuable functions essential to the environmental quality of the region. Examples include aquifer recharge areas, biologically active wetlands, forests, flood plain areas and unique natural sites. The preservation and conservation of such areas is highly important to the land use planning program and warrants attention in any accounting of natural resources.

Following in the steps of the Federal government, the Florida legislature has been very progressive in enacting legislation which recognizes the value of the State's natural assets. With these tools from which to work, State agencies such as the Florida Department of Environmental Regulation and the Department of Natural Resources are making progress in recognizing

the importance of and providing for the protection of natural areas of the State.

The North Central Florida Regional Planning Council has also recognized that this Region still has vast acreages of as yet undeveloped and environmentally valuable land. Because of the Region's predominately rural nature, it provides a unique opportunity for sound open space planning. Since new avenues for land acquisition and protection have been provided by State and Federal legislation, the Council is in some cases required or otherwise obliged to assist its member governments and the State in planning for areas of recognized environmental value.

The Council has participated in this endeavor by maintaining the Green Plan Inventory of Natural, Historical and Archeological sites in north central Florida. By providing a data base for over 220 significant natural sites in the Region, it has provided a foundation for the preparation of two documents describing the attributes of selected areas of unique environmental value. The first document entitlted Areas of Environmental Concern in Planning District III (1975) described the attributes fo twelve (12) selected areas in the region. A second document, a companion to this study, is entitled Significant Natural Areas in Planning District III. It provides an update of previously described areas and outlines site attributes and management recommendations for those areas selected for study.

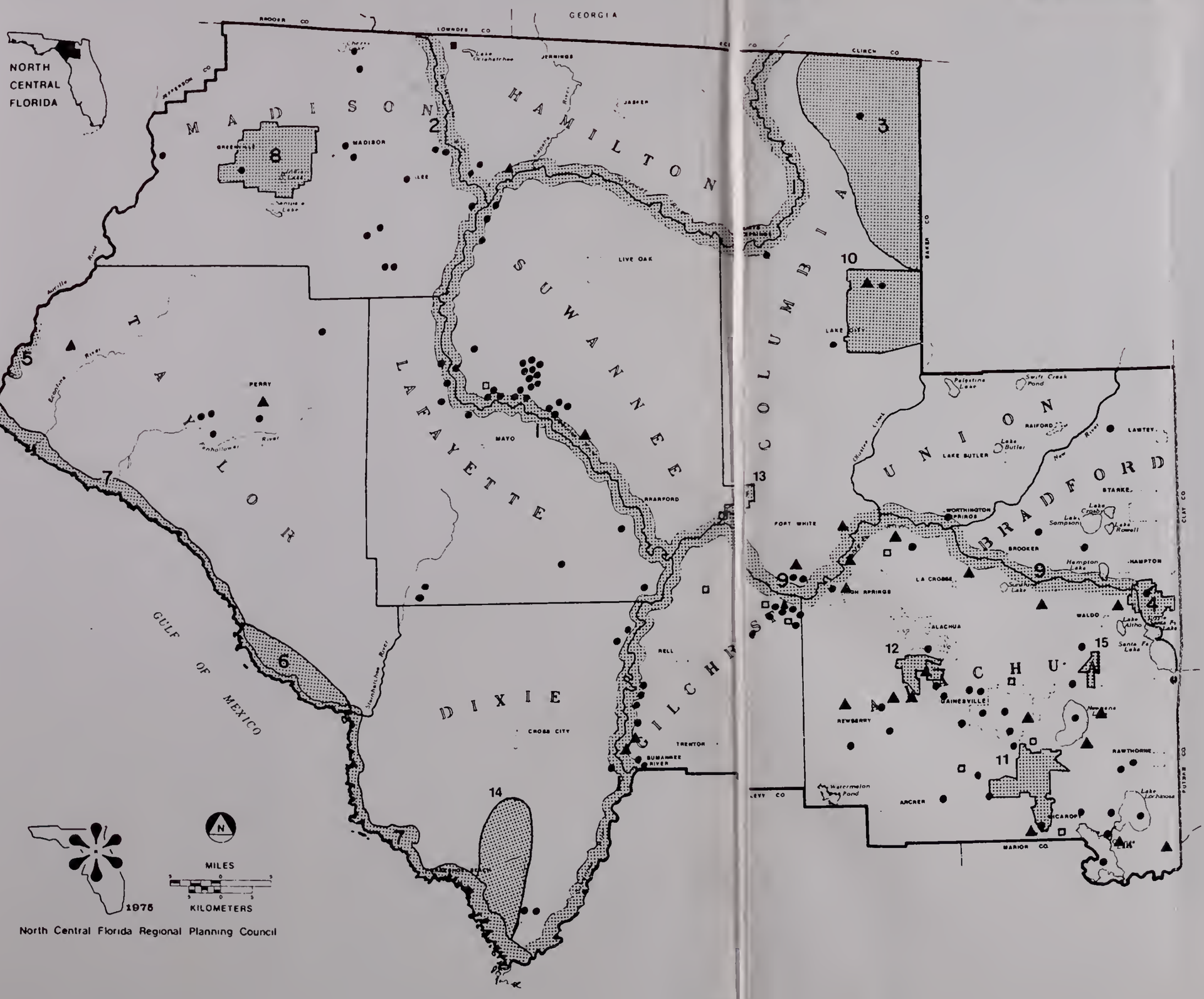
In addition to the identification and description of the sixteen (16) selected sites of environmental value, the latter report also contains a tabulation of all natural sites recognized by the Green Plan Inventory in north central Florida. A representative overview of State and Federal programs which provide for the acquisition or protection of environmentally valuable lands is included as well as a table outlining established or otherwise recognized areas in the Region such as national forests, wildlife refuges and state parks.

The map included herein entitled Significant Natural Areas, draws upon the report entitled Significant Natural Areas and the Green Plan Inventory to provide a visual representation of the occurance of important natural areas in the Region. The utilization of this map in the preparation of a composite map of natural resources is assured by the high relative values represented by the character, nature and occurance of such areas in the Region.

## EXISTING LAND USE

It is evident that the intensity to which man modifies or utilizes the land and its resources affects the integrity of almost every natural system in and around that land. Therefore, how the land is utilized determines

# SIGNIFICANT NATURAL AREAS




## SITE LIST

1 SUWANNEE RIVER
2 WITHLACOOCHEE RIVER
3 PINHOOK SWAMP
4 SANTA FE HEADWATERS
5 AUCILLA RIVER SINK
6 TIDE SWAMP
7 GULF COASTAL MARSH
8 HIXTOWN SWAMP
9 SANTA FE RIVER
10 OSCEOLA NATIONAL FOREST
11 PAYNES PRAIRIE STATE PRESERVE
12 SAN FELASCO HAMMOCK
13 ICHETUCKNEE SPRINGS STATE PARK
14 CALIFORNIA SWAMP
15 AUSTIN CAREY MEMORIAL FOREST

● NATURAL
▲ HISTORIC
□ ARCHEOLOGICAL

to a large extent the viability of natural systems which exist in any area. Because this viability usually depends upon the intensity of the activity, a map was prepared for this report representing broad intensities of existing land uses.

Intensity of land use is related to all other natural resources by limiting or modifying their occurrence or accessibility. Therefore, for purposes of illustration and comparison with natural systems, an existing land use map of the Region is included with this report. The inclusion of this map is a valuable aid in the realistic assessment of the impact of human modifications to the land in the overall sense of human system potentials.

The existing land use map was generalized from land use and land cover maps prepared from remote sensor data collected during 1972 and compiled for the Florida Division of State Planning by the U.S. Geological Survey in 1976. To facilitate regional comparisons land uses were categorized according to relative intensity of land use. From the map legend, it may be observed that lakes, reservoirs and non-forested wetlands were noted as having the least intensive uses while urban lands represent highest intensity of land use by constituting what is essentially an irretrievable committment of resources and land utilization.

## COMPARISON OF NATURAL SYSTEMS

One of the primary objectives of this report is to provide a method to facilitate the comparison and evaluation of the interactions between, or sum total of, the more important natural resources and environmental systems in north central Florida. As described in the introduction, a modified "McHarg" method of superimposing clear acetate overlays was employed to produce a composite map of natural resources. Those individual maps found in the text and utilized for the composite map include: geology, recharge, 100 year flood plain, rock and mineral resources, soil suitability for community development, soil suitability for agriculture, wetlands, vegetation, wildlife, land use and significant natural areas. By virtue of the varying pattern intensities on each of these individual maps four groups of pattern intensities are readily distinguished on the overlay composite.

The four groups represented on the composite map illustrate, by increasing pattern density, those areas with increasing relative limitations to development. This comparison is relative only to those limitations imposed by natural systems and does not include consideration of such things as the availability of public utilities, transportation networks, energy constraints or other manmade modifications of the environment.

The darkest patterns represent areas which might best be considered

preservation areas in the interest of maintaining the best long-term environmental quality. Intermediate shaded areas suggest localities which might best be served by a conservation appraoch to land use planning and regulation.

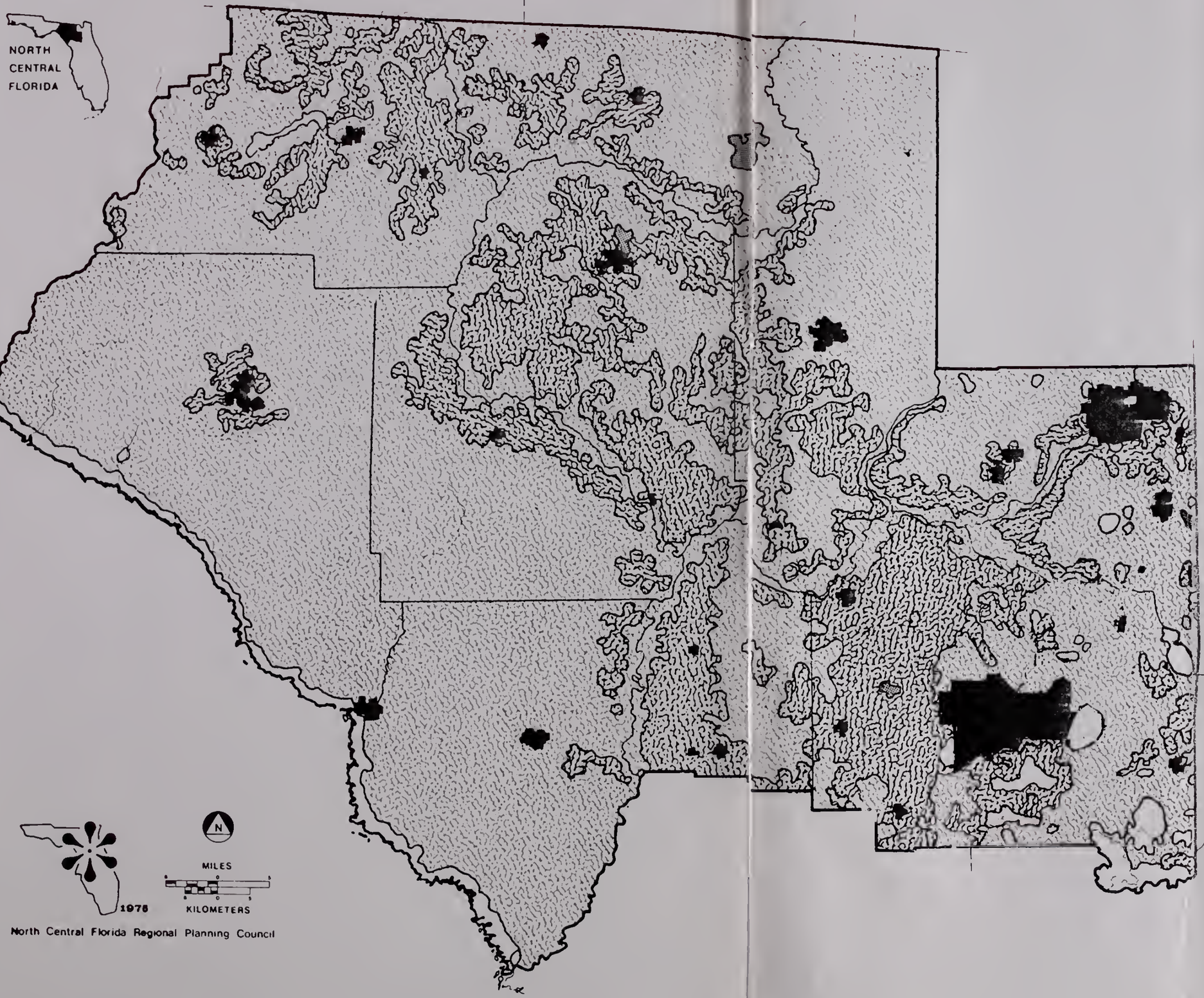
The lightest areas do not imply that there are no environmental considerations to be made in such areas. They simply suggest that, due to the relatively high degree of existing manmade modifications, such as urban or industrial development, natural systems are not generally as sensitive to change. There may, however, be important environmental considerations in lightly shaded areas as exemplified by those beneficial attributes of natural systems discussed in the chapter on climate.

The composite map does not show where development may take place in the region. Modern technology and building techniques could place development almost anywhere. However, the composite map can be considered a general guide for land use planning to show where development would have the least impact on natural systems and similarly, where costs of devevelopment would be least based upon environmental considerations. The composite map is included only as a broad overview of resources, illustrated by increasing pattern intensity natural values and sensitivity to change. The composite map will be subject to continued evaluation and interpretation

From comparisons between individual resource maps contained in this study, certain interrelationships become visually apparent. These relationships are important to land use planning because they illustrate the interdependence of natural systems, identify points of friction between natural and manmade systems. These relationships also provide a perspective of the value of these systems when defining quality of life. Such interrelationships are readily evidenced by the vegetation, soils and geology maps which, when combined, illustrate their determinant role in shaping the distribution and value of more complex natural systems. Trends evident from these resource maps clearly define major land resource areas of the region. Such trends are most evident along stream margins and distinct physiographic regions such as the coastal lowlands and the highlands areas in the north and eastern portions of the region. A number of additional complementary or conflicting resource comparisons may be made to suit the needs of the reader illustrating various degrees of land use potential.

Many problems or issues take on special significance when natural resource or other considerations transcend political boundaries. The information presented in this study identifies some old and well known issues as well as some new or potential considerations which will require combined attention and cooperation between several local governments.

Potential issues common to all governmental jurisdictions in north central Florida will certainly include the uses of natural resources. Cooperation will be required to ascertain their use, potential impacts, economics, and to reach agreement on greatly differing value assessments for each




# EXISTING LAND USE

Increasing Intensity

- LAKES, RESERVOIRS AND NON-FORESTED WETLANDS
- FORESTED LAND
- AGRICULTURAL LAND
- MINING
- URBAN, INSTITUTIONS, AND BUILT-UP LAND

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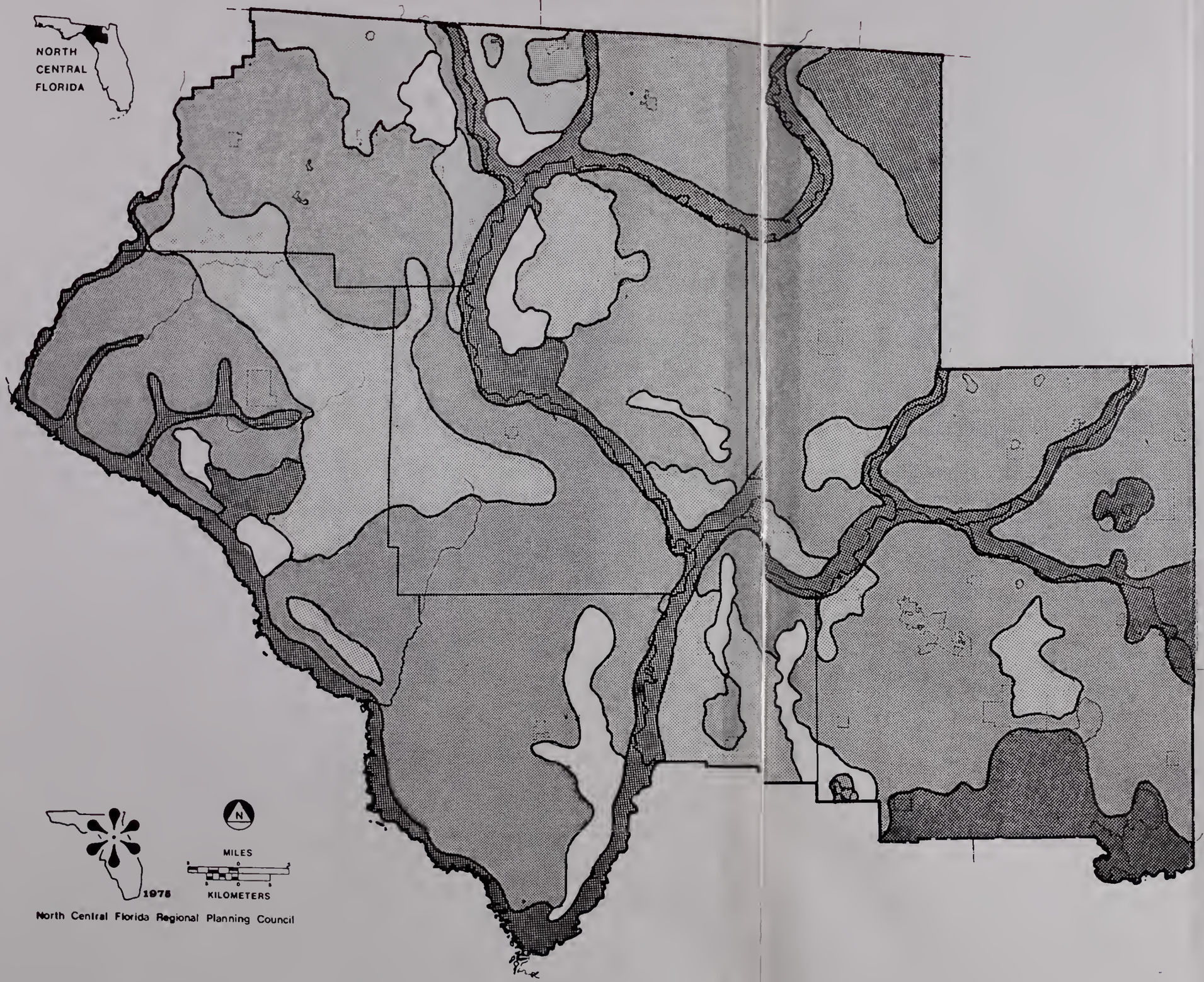
North Central Florida Regional Planning Council

resource. Of particular concern may be the use and disposition of lands suitable for phosphate mining. Similar needs for land use decisions will occur in and around areas of high environmental value and, in particular, revolving around the ultimate management of the Suwannee River and its notable resources.

The significance of natural resources to our way and quality of life is perhaps best emphasized by reference to the much publicized energy crisis. Problems concerning the availability of energy resources promise to persist through the forseeable future and cause profound changes in modern lifestyles. Realistic appraisals of future changes can anticipate significant alterations in agricultural practices, urban growth and development, transportation and many other energy dependent activities. As more information becomes available concerning the limitations and options mandated by declining energy reserves, more emphasis on this resource element will be essential to strengthen land use planning efforts.

Public recognition of resource limitations, in particular, concerning the availability of potable water and energy resources, appear certain to assure an increasing degree of importance attributed to natural resources in the land use decision making process. Future years appear certain to require a more intimate relationship between our citizens and their environment. There remains a need, therefore, for a continuing effort on the part of public agencies, specifically the North Central Florida Regional Planning Council, to broaden public awareness of environmental attributes of the region.




# COMPOSITE MAP OF NATURAL RESOURCES

Increasing Sensitivity to Development

## GOALS, OBJECTIVES AND POLICIES

### NATURAL RESOURCES: GENERAL

Goal: Support the optimal use of the Region's resources, prevent their further degredation and rectify past damage.

Objective:

1. Plan for and promote the wise use of both renewable and non-renewable natural resources.
2. Foster the reasonable development of human benefits obtainable from the natural environment.
3. Disseminate information to local governments and the general public about the elements of the natural and man-made environment, their interrelationships and major problem and opportunities they present to community and regional development.
4. Provide leadership and a workable strategy for the efficient management of the Region's natural resources.
5. Promote responsible development within the tolerances of natural systems.
6. Encourage the preservation of the Region's important open spaces.

Policies:

To incorporate elements of resource menagement into all plans and programs.

### ROCK AND MINERAL RESOURCES

Goals:

1. To conserve and provide for the wise management of rock and mineral resources.
2. To insure that land reclamation is accomplished in a manner compatible with the natural environment.

Objective:

To plan for and guide the mining and utilization and mineral resources tempered by a consideration of the balance between long

term national, state and regional needs as well as regional environmental and social cost.

Policies:

1. To promote a greater degree of land reclamation in mining areas than that required by current state regulations.
2. Encourage planned land use in areas to be strip mined.
3. Encourage local governments to enact mining and reclamation ordinances and assist in their formulation upon request.
4. To encourage the use of under utilized renewable resources over finite resources and encourage the recycling of resources.
5. Endorse and encourage the implementation of more efficient mining techniques.

## WATER RESOURCES

Goals:

1. Support the attainment of "swimable and fishable" waters throughout the Region by 1985 consistent with national goals as expressed in PL 92-500.
2. Assist in the protection and management of the surface and ground waters of the Region to insure the availability of an adequate quantity and quality of water to all users.
3. Encourage the recognition of and respect for the benefits afforded and the limitations imposed by coastal marshes, swamps, flood plains and other wetland areas.

Objectives:

1. To incorporate state and federal environmental policies and standards in the regional plans and programs involving the management and protection of water resources.
2. To control growth in recharge areas so that normal recharge functions will not be impaired.
3. To pursue programs, such as '208' areawide waste water management planning, which will afford the region mechanisms for water quality management.
4. To plan for the rational development or non-development of sensitive wetland areas.

Policies:

1. To continue to seek planning designation for this Council and Planning District III and work for the subsequent implementation of a '208' areawide waste water management plan for the region.
2. To plan for modifications to the natural hydrologic conditions by structural improvements only when determined that such activity is in the best long term public interest.

3. Discourage use of septic tanks, fertilizer, pesticides, and other contaminants on land adjacent to estuaries, coastal marshes, wetlands, lakes or streams.
4. Encourage waste water reuse and renovation.
5. Plan for urban growth in concert with local water availability.
6. Support water management district efforts in planning for long range water resource allocation.
7. Carefully plan and distribute growth around lakes, rivers, and prime recharge areas in order to insure that such development is compatible with hydrologic systems.

## VEGETATION
## (Forestry and Agriculture)

Goals:

1. Encourage the maintenance of integrity of prime agriculture lands and alleviate the threat of loss of these areas.
2. Assist in the conservation of lands best suited to agricultural uses in the region.
3. Support the management of forest resources in a manner compatible with land capabilities.

Objectives:

1. Promote an awareness of agricultural and forest management problems or opportunities.
2. Prevent or minimize loss of agricultural lands to suburban development.
3. Help minimize the potential adverse impacts that intensively managed agriculture lands may have on adjacent ecosystems.

Policies:

1. Support forest management programs which promote mixed use and esthetics and favors clear-cutting on a small tract basis only.
2. Discourage clear-cutting along lakes and streams which could cause erosion problems and endorse selective harvesting in sensitive areas.
3. Discourage site preparation and building practices that unnecessarily remove trees and natural ground cover.
4. Encourage and plan for greater efficiency and conservation in agricultural practices.

## SOILS

Goal: Give due consideration to soil potentials or limitations in the development and use of land.

Objective:

Assist in the prevention of undue loss of valuable soils due to erosion caused by agricultural mismanagement, development abuses and other human activities.

Policies:

1. When major land alterations become necessary, wherever possible, recommend that exposed soils be expeditiously stabilized and restored.
2. Incorporate consideration of soil potentials and limitations in land use planning and review processes.
3. Encourage preparation of modern soil surveys in all counties in the region.

## TOPOGRAPHY AND CLIMATE

Goals:

1. Insure that the regional planning process considers the primary determinants of climate quality as viable elements of resource management and site development.
2. In planning for future land use, insure the consideration of topography as it relates to distinct land use potentials, i.e., coastal zone, hurricane flood zone, flood plain or areas excessively steep or flat in nature.

Objectives:

1. Encourage energy conservation through proper site planning.
2. Discourage development in hazardous areas and require specific modifications adapting development to unique conditions.

Policies:

1. Encourage on site energy conservation including site planning, optimum use of natural vegetation, efficient structural designs, solar heating and cooling.
2. Encourage development to take advantage of slope and prevailing winds to minimize pollution, maximize the benefits of climate, and achieve economy in construction.

## WILDLIFE RESOURCES

Goals:

1. Provide for the highest and most practical degree of management for all game species.
2. Provide for the conservation of all wildlife and preservation of those species recognized as rare and/or endangered.

Objectives:

1. Plan for and promote the conservation of wildlife as an essential element of the ecological components in the natural system.
2. Maintain and preserve the natural complexity and stability of the region's interacting natural systems.

Policies:

1. Encourage the protection and conservation of important wildlife habitat of the region through state and federal programs.
2. Plan for the retention of important wildlife "islands" or communities in and around urban centers.
3. Enhance the recognition of wildlife values through environmental planning projects.
4. Promote the concept of wildlife as an essential element of outdoor recreation activities.

## AREAS OF ENVIRONMENTAL VALUE

Goal: Protect and preserve recognized areas of high natural environmental values, such as unique coastal marshes, springs, hammocks and geological features.

Objective:

Participate with state and federal agencies in the identification or rate or unique or natural sites.

Policies:

1. Endorse the preservation or conservation of important unique natural or environmental areas through programs such as the Florida Environmentally Endangered Lands Program.
2. Discourage development adjacent to sensitive natural areas such as coastal marshes unless development can be demonstrated to have insignificant adverse impacts or there is overriding public interest.

3. Support public use of wilderness areas only to the extent compatible with the purpose of the area.
4. Support the acquisition or management of selected natural areas by state, federal or local governments.
5. Work toward refinements in environmental assessment and planning capabilities to improve project evaluations for those activities having long term or cumulative impacts upon the physical environment.

# APPENDICES

# APPENDIX I
# A REPRESENTATIVE LIST OF VEGETATION IN NORTH CENTRAL FLORIDA

## FERNS AND FERN ALLIES

COMMON NAME

Ebony Spleenwort
Lady Fern
Mosquito Fern
Holly Fern
Florida Shield Fern
Dimorphic Chain Fern
Clubmoss
Boston Fern
Cinnamon Fern
Royal Fern
Resurrection Fern
Bracken Fern
Ladder-brake Fern
Water Spangles
Spikemoss
Wood Fern
Chain Fern

## VINES

COMMON NAME

Pepper Vine
Cross Vine
Supplejack, Rattan Vine
Cat-claw Vine
Trumpet Vine
Dodder
Wild Hydrangea
Wild Yam
Jellow Jessamine
Japanese Honeysuckle
Coral Honeysuckle
Climbing Hamp Vine
Virginia Creeper
Maypops
Kudzu Vine
Poison-ivy
Cherokee Rose
Greenbrier
Catbrier

## VINES (CONTINUED)

Bamboo-brier
Wild Sarsaparilla
Summer Grape
Muscadine
Frost Grape
Wisteria

## TREES

COMMON NAME

### Rich Hammocks

Spruce, pine, smooth-bark pine, cedar pine
Southern red-cedar
Cabbage palmetto
Wax myrtle
Pignut hickory
Bluebeech, American hornbeam
Eastern hop-hornbeam, ironwood, American hop-hornbeam
Ashe chinquapin, coastal chinquapin
Laurel oak
Water oak
Basket oak, cow oak, swamp-chestnut oak
Shumard oak
Live oak
Sugarberry, Hackberry
Florida elm
Red mulberry
Southern magnolia, bullbay
Witch-hazel
Sweetgum, red gum
Parsley haw
May haw, apple haw
Green haw
Carolina laurel cherry
Black cherry
Red bud
Winged sumac, shining sumac
Poison sumac
Possum haw

TREES (CONTINUED)

American holly
Yaupon
Florida maple, Southern sugar maple
Boxelder
Red maple
Red buckeye
Basswood, Linden
Loblolly-bay
Devils-walking-stick
Stiff cornel dogwood
Sparkleberry
Persimmon
Sweetleaf, horse-sugar
Old-mans-beard, fringe-tree
Swamp ash, Florida ash
Green ash
Wild-olive, devilwood

Fertile Uplands

Shortleaf pine
Loblolly pine, oldfield pine
Southern red cedar
Waxmyrtle, Southern bayberry
Pignut hickory
Mockernut hickory, white hickory
Southern red oak, Spanish oak
Post oak
Eastern hop-hornbeam, ironwood, American hop-hornbeam
White oak
Bluff oak
Laurel oak
Blackjack oak
Water oak
Shumard oak
Live oak
Sugarberry, hackberry
Winged elm, cork elm
Red mulberry
Southern magnolia, bullbay
Redbay
Sassafrass
Sweetgum
Dwarf haw, one-flowered haw

TREES (CONTINUED)

Florida haw, Jacksonville haw
Southern crab apple
Rusty blackhaw
Chickasaw plum
Black cherry
Hercules-club, prickly-ash
Winged sumac, shining sumac
Carolina holly
American holly
Yaupon
Red buckeye
Florida soapberry, wild china-tree
Basswood, linden, wahoo
Staggerbush
Sparkleberry
False buckthorn, gum bumelia
Persimmon
White ash
Wild-olive, devilwood

Ponds

Slash pine, yellow slash
Pond- cypress
Carolina willow, coastal plain willos
Waxmyrtle
Sweetbay, white bay, sweetbay magnolia
May haw, apple haw, shining haw
Green haw
Honey locust
Poison sumac
Large gallberry, sweet gallberry
Swamp cyrilla, titi, he-huckleberry
Myrtle-leaved holly, myrtle dahoon
Red maple
Water tupelo, cotton gum
Swamp tupelo, blackgum
Ogeechee tupelo, Ogeechee-lime
Carolina ash, water ash, swamp ash
Button bush

TREES (CONTINUED)

Sand Ridge and Dunes

Sand pine
Longleaf pine
Ashe chinquapin, coastal chinquapin
White oak
Chapman oak
Sand-live oak
Bluejack oak, upland willow oak
Turkey oak, sand blackjack
Southern red oak, Spanish oak
Blackjack oak
Sand-post oak
Myrtle oak
Running oak
Paw paw
Hercules club, prickly-ash
Carolina holly
Yaupon
Staggerbush
Persimmon

Swamps

Slash pine, yellow slash
Pond-cypress
Swamp tupelo, blackgum
Sweetbay
Little-leaf titi, little-leaf cyrilla
Myrtle dahoon, Myrtle-leaved holly
Waxmyrtle, Southern bayberry
Water hickory, swamp hickory
Hazel alder
Water oak
Yellow-poplar, tulip-tree
Sweetbay, white bay, sweetbay magnolia
Swampbay
Winged sumac, shining sumac
Poison sumac
Swamp cyrilla, titi, he-huckleberry
Dahoon holly
Large gallberry, sweet gallberry

TREES (CONTINUED)

Red maple
Water tupelo, cotton gum
Ogeechee tupelo, Ogeechee-lime
Stiffcornel dogwood
American snowbell, storax
Carolina ash, water ash, swamp ash
Swamp ash, Florida ash
Green ash
Buttonbush
Pickneya, maidens blushes
Possonhaw viburnum

Riverbanks

Bald-cypress
Water tupelo
Southern red cedar
Carolina willow, coastal plain willow
Black willow
Waxmyrtle, Southern bayberry
Water hickory, swamp hickory
Hazel alder
River birch
Over-cup oak
Water oak
Willow oak
Basket oak, cow oak, swamp-chestnut oak
Live oak
Suggarberry, hackberry
Planer tree, water elm
Florida elm
Red mulberry
Yellow poplar, tulip-tree
Southern magnolia, bullbay
Sweetgum-red gum
Red haw, small-fruited thorn
May haw, apple haw, shining haw
Honey-locust
Winged sumac, shining sumac
Swamp cyrilla, titi, he-huckleberry
Red maple
Ogeechee tupelo, ogeechee-lime
Stiff cornel dogwood
Persimmon
Little silverbell

TREES (CONTINUED)

Old-mans-beard, fringe-tree
Wild-olive, devilwood
Walter viburnum

HERBS

COMMON NAME

Shy-leaves
Yellow Colicroot
White Colicroot
Wild Onion
Alligator Weed
Pigweed
Thorny Pigweed
Ragweed
Broomsedge
Marsh Parsley
White Prickly Poppy
Yellow Prickly Poppy
Green Dragon
Jack-in-the-pulpit
Wire Grass
Switch Cane
Milkweed
Butterfly Weed
False-foxglove
False Indigo
Begonia
Green-eyes
Spanish Lettles
Rayless Goldenrod
False Nettle
Spiderlings
Fanwort
Indian Plantain
Sea-rocket
Grass-pink Orchid
Wine Cups
Baybean
Canna
Shepherd's Purse
Bitter-cress
Sedge

HERBS (CONTINUED)

Partridge Pea
Sicklepod
Sand-spur
Butterfly Pea
Mouse-eared Chickweed
Cootail
Wild Chervil
Sun-bonnets
Lamb's Quarters
Water Hemlock
Horrid Thistle
Thistle
Saw-grass
Virgin's Bower
Butterfly Pea
Treadsoftly
Dayflower
Horseweed
Rabbit Bells
Rattle Box
Croton
Milkweed Vine
Sedge
Tansy Mustard
Tick Clover
Begger's Ticks
White-top Sedge
Buttonweed
Salt Grass
Sundew
Water Hyacinth
Spike-rush
Elephant's Foot
Green Fly Orchid
Fireweed
Daisy Fleabane
Bog Button
Wild Buckwheat
Button Snakeroot
Cherokee Bean
Dog Fennel
Spurge
Cottonweed
Indian Blankets
Milk-pea
Bedstraw

APPENDIX I - Continued

HERBS (CONTINUED)

Cranesbill
Standing-cypress
Rabbit Tobacco
Bachelor's Button
Hedge Hyssop
Bitter Weed
Sneeze-weed
Rockrose
Sunflower
Coast Sunflower
Heliotrope
Silver Sword
Wolly Golden Aster
Camphor Plant
Rose Mallow
Hawkweed
Fairy Footprints
Marsh Pennywort
St. John's Wort
Pineweed, Orange Glass
Dwarf St. John's Wort
Yellow Star Grass
Morning Glory
Scarlet Morning Glory
Man-of-the-earth
Railroad Vine
Cypress Vine
Wild Iris
Rush
Black Rush
Seashore Mallow
Dwarf Dandelion
Redroot
Wild Lettuce
Henbit
Pepper Grass
Pin Weed
Duckweed
Bush-clover
Blazing Star
Frog's-bit
Sea Lavender
Toad-flax
Match-heads
Flowering Straws
Loosestrife

HERBS (CONTINUED)

Barbara's Buttons
Bog Moss
Hop Clover
Sweet Clover
Creeping Cucumber
Partridge Perry
Indian Chick-weed
Horse Mint
Indian Pipes
Parrot Feather
Watercress
Yellow Lotus
Spatter-dock
Water-lily
Water-bananas
Evening Primrose
Wood Grass
Golden Club
Yellow Wood Sorrel
Violet Sour-grass
Water Dropwort
Maiden-cane
Panic Grasses
Pellitory
Whitlow-wort
Bahia Grass
Beard-tongue
Roadside Phlox
Ground-cherries
Galse Dragon-head
Pokeweed
Blue-flowered Butterwort
Yellow-flowered Butterwort
Small-flowered Butterwort
Water-lettuce
Plantain
Marsh-fleabane
Rose Pogonia Orchid
Painted-leaf
Jointweed
Smartweed
Leaf-cup
Pickerel-weed
Portulaca
Lanceolate Pondweed
Grass-leaf Pondweed

HERBS (CONTINUED)

Ovate-leaf Pondweed
Mermaid-weed
Scurf-pea
Black-root
Mock Bishop's-weed
False Dandelion
Wild Radish
Meadow-beauty
Beak Rushes
Baby Petter
Black-eyed Susan
Dock
Narrow-leafed Arrowroot
Arrowroot
Glass-wort
Lyre-leaf Sage
Water-pimpernel
Snakeroot
Hooded Pitcherplant
Lizard-tail
Sensitive-brier
Wool-grass
Bulrush
Skullcap
Butterweed
White-top Aster
Sea-purslane
Foxtail Grass
Sleepy Catchfly
Blue-eyed Grass
Nightshade
Goldenrod
Bur-reed
Cord Grass
Venus' Looking-glass
Duck-weed
Smut-grass
Florida Betony
Chick-weed
Queen's-root
Wild-bean

HERBS (CONTINUED)

Hoary-pea
Spanish-moss
Spiderwort
Clover
Dutch White Clover
Deer's Tongue
Cattail
Sea-oats
Bladderwort
Moth Mullein
Verbena
Narrow-leafed ironweed
Ironweed
Veronica
Vetch
Periwinkle
Florida Violet
Lance-leaved Violet
Seven-lobed Violet
Walter's Violet
Yellow-eyed Grass
Zephyr Lily

Source: Local Flora by Dana G. Griffin, III, Department of Botany, University of Florida, and Florida Cooperative Extension Service, IFAS, University of Florida, Gainesville, Florida. Mr. Mike Bordyn, Alachua County Forester

# APPENDIX 2
# A REPRESENTATIVE LIST OF WILDLIFE SPECIES IN NORTH-CENTRAL FLORIDA

## BIRDS

Wild Turkey
Wood Duck
Horned Grebe
Double-Crested Cormanant
Great Blue Heron
Louisiana Heron
Snowy Egret
Yellow-Crowned Night Heron
Least Bittern
White Ibis
Snow Goose
Mallard
Black Duck
Pintail
Blue-Winged Teal
Shovler
Redhead
Lesser Scaud
Bufflehead
Red-Breasted Merganser
Turkey Vulture
Swallow-Tailed Kite
Sharped Shinned Hawk
Red-Shouldered Hawk
Broad-Winged Hawk
Kestrel
Kimpkin
Virginia Rail
Purple Gallinule
American Coot
American Golden Plover
Common Snipe
Spotted Sandpiper
Greater Yellowlegs
Pectoral Sandpiper
Least Sandpiper
Black-Necked Stilt
Ring-Billed Gull
Laughing Gull
Forrester's Tern
Common Tern
Black Skimmer
Mourning Dove
Yellow-Billed Cuckoo

## BIRDS (CONTINUED)

Barn Owl
Great Horned Owl
Burrowing Owl
Whip-Poor-will
Chimney Swift
Bobwhite Quail
Common Loon
Pied-Billed Grebe
Anhinga
Great Egret
Little Blue Heron
Cattle Egret
Black-Drowned Night Heron
American Bittern
Glossy Ibis
Fulvus Tree Duck
Mottled Duck
Gadwall
Green-Winged Teal
American Widgeon
Ring-Necked Duck
Canvasback
Common Goldeneye
Ruddy Duck
Hooded Merganser
Black Vulture
Mississippi Kite
Cooper's Hawk
Red-Tailed Hawk
Marsh Hawk
Merlin
King Rail
Sora
Common Gallinule
Killdeer
Woodcock
Upland Sandpiper
Solitary Sandpiper
Lesser Yellowlegs
White-Rumpled Sandpiper
Dowitcher Sp.
Herring Gull
Bonapartes Gull
Black Tern

BIRDS (CONTINUED)

Rock Dove
Ground Dove
Black-Billed Cuckoo
Screech Owl
Barred Owl
Chuck-Willis-Widow
Common Night Hawk
Belted Kingfisher
Common Flicker
Ruby-Throated Hummingbird
Pileated Woodpecker
Red-Headed Woodpecker
Hairy Woodpecker
Great Crested Fly Catcher
Arcadian Flycatcher
Tree Swallow
Barn Swallow
Bank Swallow
Blue Jay
Fish Crow
Tufted Titmouse
Brown Creeper
Winter Wren
Long-Billed Marsh Wren
Mockingbird
Brown Thrasher
Hermit Thrush
Gray-Checked Thrush
Eastern Bluebird
Golden-Crowned Kinglet
Water Pipit
Loggerhead Skrike
White-Eyed Vireo
Soliatry Vireo
Black & White Warbler
Worm-Eating Warbler
Blue-Winged Warbler
Orange-Crowned Warbler
Yellow Warbler
Cape May Warbler
Yellow-Rumped Warbler
Yellow-Throated Warbler
Black Poll Warbler
Palm Warbler
Northern Waterthrush
Kentucky Warbler

BIRDS (CONTINUED)

Hooded Warbler
House Sparrow
Eastern Meadowlark
Orchard Oriole
Rusty Blackbird
Bloat-Tailed Grackle
Brown-Headed Cowbird
Summer Tanager
Rose-Brested Grosbeak
Indigo Bunting
Dicksissel
Pine Siskin
Rufous-Sided Towhee
Grasshopper Sparrow
Backman's Sparrow
Chipping Sparrow
White-Crowned Sparrow
Fox Sparrow
Song Sparrow
Red-Bellied Woodpecker
Yellow-Bellied Sapsucker
Downy Woodpecker
Eastern Kingbird
Eastern Phoebe
Eastern Wood Pewee
Rough-Winged Swallow
Cliff Swallow
Purple Martin
Common Crow
Carolina Chickadee
Brown-Headed Nuthatch
White-Breasted Nuthatch
House Wren
Carolina Wren
Short-Billed Marsh Wren
Gray Catbird
Wood Thrush
Swainson's Thrush
Veery
Blue-Gray Gnatcatcher
Ruby-Crowned Kinglet
Cedar Waxwing
Starling
Yellow-Throated Warbler
Red-Eyed Vireo
Prothonotary Warbler

BIRDS (CONTINUED)

Golden-Winged Warbler
Tennessee Warbler
Parula Warbler
Magnolia Warbler
Black-Throated Blue Warbler
Blackburnian Warbler
Chestnut-Sided Warbler
Prairie Warbler
Ovenbird
Louisiana Thrush
Common Yellow Throat
American Redstart
Bobolink
Red-Winged Blackbird
Northern Oriole
Brewers Blackbird
Common Grackle
Scarlet Tanager
Cardinal
Blue Grosbeak
Painted Bunting
Purple Finch
American Goldfinch
Savannah Sparrow
Vesper Sparrow
Dark-Eyed Junco
Field Sparrow
White-Throated Sparrow
Swamp Sparrow

MAMMALS

Whitetail deer
Eastern Gray Squirrel
Southern Flying Squirrel
Eastern Harvest Mouse
Rice Rat
Florida Water Rat
Marsh Rabbit
Eastern Wood Rat
Southern Golden Mouse
Red Fox

MAMMALS (CONTINUED)

Normay Rat
Grey Fox
Bobcat
Opossum
Shorttailed Shrew
Mississippi Mytosis (Bat)
Least Shrew
Oldfield Mouse
Florida Mouse
Wild Hog
Fox Squirrel
Southern Picket Gopher
Cotton Mouse
Cotton Rat
Eastern Cottontail Rabbit
Hispis Cotton Rat
Nine Banded Armadillo
House Mouse
Striped Skunk
Florida Black Bear
Florida Otter
Eastern Mole
Seminold Bat
Big-Eared Bat
Black Rat
Raccoon
Eastern Spotted Skunk

Source: Modified from the Natural Resources Study for Alachua County, Florida, 1975.

ENDANGERED SPECIES CONTAINED IN FLORIDA CODE*

| State Listed Only | Also Federally Listed |
|---|---|
| Pine Barrens Tree Frog | Hawksbill Turtle |
| East Coast Salt Marsh Snake | Ridley Turtle |
| Short-Tailed Snake | Ivory-billed Woodpecker |
| Wood Stork | Red-cockaded Woodpecker |
| Snowy Plover | American Perequine Falcon |
| | Bachman's Warbler |
| | Kirtlan's Warbler |
| | Panther |

THREATENED SPECIES CONTAINED IN FLORIDA CODE*

| State Listed Only | Also Federally Listed |
|---|---|
| Florida Gopher Frog | Okaloosa Darter |
| Suwannee Bass | Shortnose Sturgeon |
| Suwannee Turtle | Alligator |
| Loggerhead Turtle | Bald Eagle |
| Gopher Turtle | Brown Pelican |
| Blue-Tailed Mole Skink | Actic Perequine Falcon |
| Sand Skink | Manatee |
| Rosy Rat Snake | |
| Indigo Snake | |
| Brown Snake | |
| Ribbon Snake | |
| Magnificant Frigate Bird | |
| Osprey | |
| Southeastern Kestrel | |
| Oyster Catcher | |
| Roseate Tern | |
| Scrub Jay | |
| Louisiana Seaside Sparrow | |
| Roseate Spoonbill | |
| Florida Sandhill Crane | |
| Short-Tailed Hawk | |
| Shermans Fox Squirrel | |

*Lists of threatened and endangered species whose range extends into north-central Florida was prepared with the assistance of Mr. Steve Nesbitt and Mr. Jim Brady, Wildlife Biologists with the Florida Game and Fresh Water Fish Commission, Wildlife Research Station, Gainesville, Florida, November 14, 1977.

# APPENDIX 3
# COMPILATION OF TECHNICAL DATA

The information appearing in tables of the Natural Resources Study and Land Use Plan for north central Florida are similar in nature. Both reports define land uses in forms suitable to the specific needs and intent of each individual study. Although all information presented was compiled from authoritative sources discrepancies may be observed between these documents and even individual tables.

In preparing these documents, the need for a diversity of information mandated the use of a number of technical reference documents. Although efforts were made to achieve consistency, no major attempt was made to reconcile all sources of data. Therefore, minor inconsistencies between figures presented in both documents are apparent. These inconsistencies are attributed to both variations in land use definition as well as data sources.

Definitions in land use categories can be misleading in terms of the data presented unless each text is thoroughly read. For example, forestry figures in the National Resources Study pertain to total forested lands, while similar figures given in the Land Use Plan pertain specifically to commercial forestry lands. This is also illustrated by forest figures given for each county. In the instance of Alachua County, the Natural Resources Study reports total forest lands as 311,400 acres, and similarly the Land Use Plan records a total of 258,000 acres of commercial forest lands.

A second problem, that associated with different data sources, must remain unresolved pending further land use analyses as anticipated in the preparation of the Regional Comprehensive Plan. One example of this type problem can readily be illustrated by citing total land area figures for Alachua County from three different sources. These include:

Forest Statistics for Northeast Florida (1970) - 588,200 acres
1974 Census of Agriculture - 586,048 acres
Florida Statistical Abstract (1976) - 617,454 acres.

Despite inconsistencies of this nature the reader should note that the discrepencies between reports and individual tables represent an average error of less than five percent and typically less than one percent. Therefore, the broad regional land use analyses contained in both documents are unaffected by this insignificant degree of difference.

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